GPI
Greenman-Pedersen, Inc.
Engineering and Construction Services

Traffic Engineering Studies
FINAL Report - May 2016

Traffic engineering investigations at various locations within the Town of Wilton:

- **Carr Road and Northern Pines Road Intersection**
- **Carr Road and Jones Road Intersection**
- **Carr Road Planning for Gavin Park Path**

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1.0 Introduction

Greenman-Pedersen, Inc. (GPI) has been retained by the Town of Wilton to perform traffic engineering investigations at the following locations:

- Carr Road and Northern Pines Road Intersection
- Carr Road and Jones Road Intersection
- Carr Road between Northern Pines Rd and Jones Road as it relates to the Gavin Park Path Planning
- Gurn Springs Road and Dimmick Road Intersection

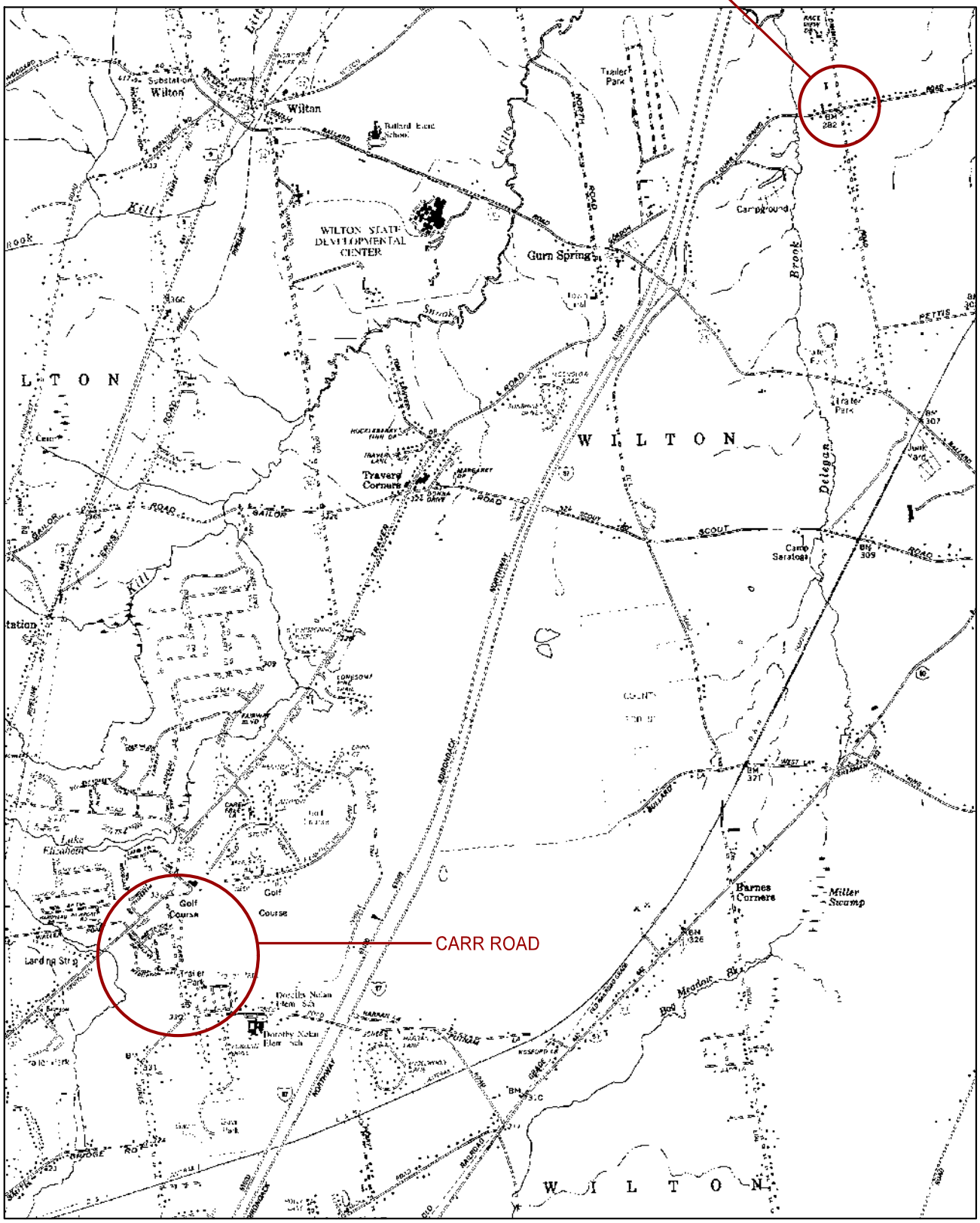
A site location map depicting these locations is included as Figure 1 on the next page.

The purpose of these studies was to review the existing and forecasted conditions, identify safety and operational deficiencies and to evaluate potential identify corrective actions that could improve safety and/or reduce delay.

For the Gavin Park Path Planning along Carr Road, the purpose was to investigate geometric alternatives to provide a multi-modal link along Carr Road that could be incorporated into a future Gavin Park Path. This investigation is to identify potential impacts on utilities, right-of-way and road alignment.

The results of the investigation into the Gurn Springs Road and Dimmick Road Intersection were presented to the Town in a letter from GPI dated December 4, 2015. This letter is included in the appendix.

The analyses and findings for each of the areas described below are detailed in separate Sections of this report.

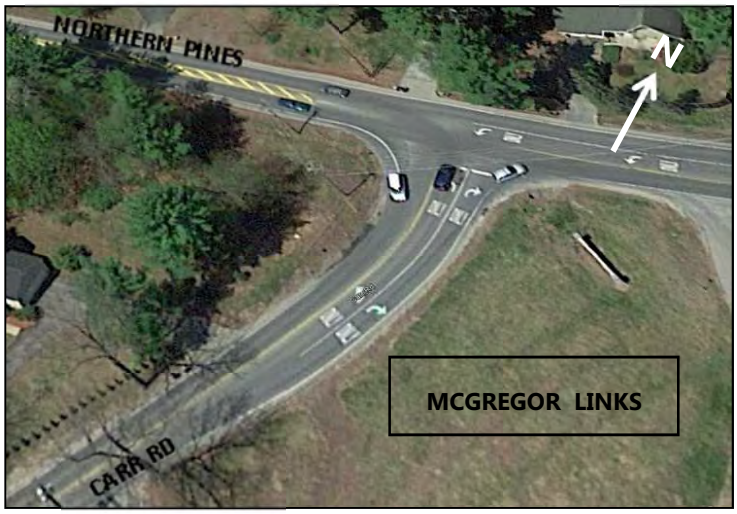


Greenman-Pedersen CONSULTING ENGINEERS GPI 80 Wolf Road Suite 300 Albany, NY 12205	TOWN OF WILTON NEW YORK	TRAFFIC ENGINEERING STUDIES PROJECT LOCATION MAP

JOB NO.	SCALE:	DATE:	FIGURE NO.
2015200.00	NO SCALE	OCT. 2015	1

2.0 Northern Pines Road and Carr Road Intersection

2.1 Background Information



The Northern Pines Rd (Saratoga County Route 34) and Carr Rd intersection (depicted to the right) is a 3-leg intersection with stop sign control for the Carr Rd northbound approach. Northbound there is a 125 foot long right turn lane, in addition to the left turn lane, and westbound there is a 200 foot long left turn lane in addition to the through traffic lane. Eastbound, there is a single shared Right-Through lane.

Both Carr Road and Northern Pines Road are posted with a 40 mph speed limit. However, the intersection is located at the start of a horizontal curve to the east, and curve warning signs with a 25 mph advisory speed are posted on either side of the intersection.

This location has been the subject of two signal warrant studies in the past (2008 by CHA and 2009 by Saratoga County DPW) , but in both cases it was found that a traffic signal was not warranted.

Accident history was also reviewed at this location as part of the 2015 Update to the Town of Wilton's Townwide Traffic Planning Study. In that study, it was found that 10 accidents occurred over the most recently reported 3-year period. This translated to an accident rate of 0.95 accidents per million entering vehicles (Acc/MEV), which is considerably higher (15 times) than the 0.06 acc/MEV statewide average for similar facilities.

To address operational and safety concerns at this location several investigations were conducted. These investigations included a review of sight distance, roadway geometry, accident history, existing signage and traffic control. An updated signal warrant analysis was also conducted, and geometric improvement concepts were developed. These tasks are detailed below.

2.2 Accident Review

As mentioned above, 10 accidents were noted at this location in the 3-year period between January 1, 2011 and December 31, 2013. Of these accidents, 70% involved some form of right angle movement between the two roadways (see accident diagram in Appendix A). Contributing factors for these type accidents typically include limited sight lines, insufficient advance warning of the intersection, and/or traffic congestion sufficient enough to cause drivers to accept shorter than desirable gaps in traffic to make their movement. All these

factors were reviewed as part of the intersection investigation. No other accident types appear to be an issue at this location.

2.3 Sight Distance Review

Sight Distance measurements at the Northern Pines Rd and Carr Rd intersection were conducted in September 2015, using the guidelines detailed in AASHTO's *A Policy on Geometric Design of Highways and Streets*, 2011. During that time, the sight distance from Carr Road was noted as 650 feet to the left and 490 feet to the right. Based on the AASHTO publication for a 40 mph design speed, 445 feet should be sufficient for safe operations at an intersection, which is satisfied at this location. However, vegetation on the western side of the intersection does partially obscure some of the visible range to the left, so it is recommended that vegetation west of the intersection be trimmed back to the limits of the right-of-way to ensure the available sight distance is fully realized.

Additionally, east of the intersection there are trees blocking visibility around the horizontal curve, if these trees were removed it would increase the sight distance in that direction. Even though the available sight distance does meet industry guidelines, the accident history suggests that an improvement of sight distance could improve safety. As such, it is recommended that the Town or Saratoga County remove up to four trees and trim back vegetation that appear to be within the right-of-way on the north side of Northern Pines Road, approximately 375'- 450' from the Carr Road intersection. It is possible that improved sight distance could reduce the number of right angle accidents at this intersection.

2.4 Signage Review

Signage surrounding the Northern Pines Rd and Carr Rd intersection were reviewed in the field, and the following was noted:

- There are "Curve" warning signs (MUTCD Sign Number W1-2) with 25 mph advisory speed panels on Northern Pines Road on either side of the horizontal curve in which Carr Road is located. The *Manual on Uniform Traffic Control Devices* (MUTCD), 2009 recommends the use of "Turn" Warning signs (W1-1) where advisory speed in 30 mph or less. As such, it is recommended that these sign panels be replaced by Saratoga County with W1-1 signs to improve driver awareness of the advisory speed.

W1-1

- There is a "Stop Ahead" warning sign on Carr Rd in advance of the intersection. However, the sign is a text only version, which is no longer accepted by the MUTCD, It is recommended that the sign be replaced by the Town with a "Stop Ahead" symbol warning sign (W3-1).

W3-1

These signing recommendations above will bring more awareness to the traffic conditions, which could reduce both the right angle and rear end accidents currently noted at this intersection.

2.5 Intersection Traffic Control Review

Traffic control at the intersection is maintained through the use of stop sign control on Carr Road. Analyses were performed to determine the capacity and level of service of the present condition and to investigate the potential for a change in traffic control to either a traffic signal or roundabout. For these investigations, traffic volumes from various sources were compiled and adjusted by an annual growth rate to develop 2015 existing condition traffic volumes. The annual growth rates applied, which were developed through a review of historic traffic volumes, were 2.1% for Northern Pines Road traffic and 1.6% for Carr Road traffic.

2.5.1 Level of Service Analysis

The operating conditions of transportation facilities are evaluated based on the relationship of existing or projected traffic volumes to the theoretical capacity of the highway facility. Various factors affect capacity including traffic volume, travel speed, roadway geometry, grade, number and width of travel lanes and intersection control. The current standards for evaluating capacity and operating conditions are contained in *the Highway Capacity Manual* (HCM 2010), published by the Transportation Research Board. The procedures describe operating conditions in terms of Level of Service (LOS). In general, "A" represents the best operating condition with unrestricted flow and little or no delay per vehicle, and "F" represents the worst, with congested conditions, long delays and poor traffic operations. LOS C or better is generally desirable, but LOS D for signalized locations and LOS E for unsignalized are generally acceptable during peak periods as long as the volume to capacity ratio (v/c) is below 1.0.

Using the 2015 traffic volumes projected from past traffic count data, the PM peak hour level of service at the Northern Pines Road and Carr Rd intersection is as follows:

- Westbound Left (from Northern Pines Road): LOS A (8.8 sec/veh delay) (v/c=0.16)
- Northbound Left (from Carr Road): LOS E (41.3 sec/veh delay) (v/c=0.63)
- Northbound Right (from Carr Road): LOS B (14.4 sec/veh delay) (v/c=0.44)

All other movements at the intersection would not typically experience any delay and will operate at LOS A. Of the movements that do experience delay, all are within acceptable levels of service with sufficient capacity to handle demand although the northbound left from Carr Road is approaching capacity. See Appendix B for the capacity analysis worksheet for this intersection.

2.5.2 Signal Warrant Analysis

The Manual on Uniform Traffic Control Devices (MUTCD) outlines nine warranting conditions that could indicate the need for a traffic signal at a particular location. These warrants consider sustained traffic over eight and four hour periods; peak hour traffic; and factors such as pedestrian volume, school crossings, coordination, accidents, proximity to railroad crossings and the road network in general. Of these warrants, the eight hour warrant provide the strongest justification for a signal installation and is the primary warrant considered by NYSDOT when considering the installation of a traffic signal on their facilities. It should be noted though, as stated in the *MUTCD "The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal." "A traffic control signal should not be installed unless an engineering study indicates that installing a traffic control signal will improve the overall safety and/or operations of the intersection."* For the Northern Pines Rd and Carr Rd intersection, the most relevant warrants are as follows:

- Warrant 1: 8 hour traffic volumes
- Warrant 2: 4 hour traffic volumes
- Warrant 3: Peak hour traffic volume
- Warrant 7: Crash Experience

None of the other warrants are applicable for this location.

A warrant analysis was performed for this location and the results indicated that none of the three warrants reviewed were satisfied. The warrant analysis worksheet detailing this investigation is located in Appendix C of this report.

Give that the movements at this intersection are not above capacity and there were no signal warrants satisfied, it is not recommended to install a traffic signal at this location.

2.5.3 Summary of Needs and Deficiencies

A review of the engineering investigations indicate the following:

- The recent accident/crash history is significantly higher than the statewide average for similar intersections
- Sight distance at the intersection is limited by trees overgrown into the right of way which could be contributing to the accident/crash history.
- Traffic signs at the intersection do not meet current MUTCD guidelines.
- Moderate delays are experienced on the Carr Road approach.
- A traffic signal is not warranted at this time.

2.5.4 Roundabout Considerations

Although a traffic signal is not warranted at the Northern Pines Road and Carr Road intersection, the prevalence of right angle accidents at this location may require more remediation than addressing the sight distance and signing as noted. If these type accidents persist, an option that could be considered is a roundabout. A roundabout is a circular intersection configuration that features a yield condition on each of the entering approaches. Roundabouts have been shown to produce less queueing and delays than a signalized intersection, and they eliminate the possibility of right angle accidents, which is the prevalent accident type at this intersection. In addition, accidents that would occur at a roundabout are typically lower speed accidents with much less change of personal injury.

For this location, two roundabout alternatives were considered; (1) an Urban Compact Roundabout with 80 foot inscribed diameter and (2) an Urban Single Lane Roundabout with 100 foot inscribed diameter. Concept sketches for each of these configurations are included in Appendix D of this report.

Both options will provide acceptable levels of service, with no approach operating worse than LOS B with 12.8 sec/veh of delay in the PM peak hour. However, the impacts of each on utilities, right-of-way and truck traffic are different for each. These differences are outlined in the following table.

Northern Pines Rd/Carr Rd - Roundabout Comparison Summary

Alternative	Max. Design Vehicle	Right-of-Way Impact	Utility Relocations
Compact (80' dia.)	Single Unit Truck/Bus	None	1 pole
Single Lane (100' dia.)	WB-50 Tractor Trailer	3 properties (0.042 acres)	3 poles

As the table shows, the 80' diameter roundabout has less utility and property impacts. However, it does not accommodate tractor trailer traffic. Traffic count data shows from 2014 indicated there was an average of one tractor trailer truck a day on Northern Pines Road. If a compact roundabout was constructed, the road would need to be posted to restrict truck traffic and those tractor trailers would need to find an alternative route.

We have also reviewed the truck turning templates for both the Wilton and Greenfield fire trucks for use within both an 80 foot diameter and 100 foot diameter roundabouts. This review was performed user a program called Autoturn within our CADD software. For the review we used the fire truck specification data provided to us from the Town, created a truck template to simulate the truck turn movement characteristics for each type fire truck and projected those templates onto both size roundabouts. The results of our review revealed that both type fire trucks were able to traverse both the 100 foot and 80 foot diameter roundabouts within the roadway pavement. These trucks will not require any special truck apron or overhang area to move through the roundabout.

2.6 Findings & Recommendations (Northern Pines Rd and Carr Rd)

Based on the investigations performed, the findings and recommendations for this intersection are as follows:

- Accident rate at this intersection is above the statewide average for similar locations, based on the accidents reported, right angle accidents appear to be most prevalent.
- A traffic signal is not warranted at this location based on estimated 2015 traffic volumes, and levels of service at the intersection are within acceptable ranges. A traffic signal installation is not recommended for this location at this time.
- The construction of a roundabout is feasible at this location but will require the acquisition of additional ROW. The amount of ROW needed depends on the size of the roundabout to be constructed.

Short Term Recommendations

- Though sight distance meets acceptable standards at this intersection, trimming of vegetation and removal of 2-4 trees located within the right-of-way would enhance visibility. It is recommended that the Town perform these tasks as a maintenance function, if possible.
- Signing near the intersection needs updating to meet current MUTCD standards. "Curve" signs (W1-2) should be changed to "Turn" signs (W1-1) on either side of the intersection along Northern Pines Road, and the "Stop Ahead" sign panel on Carr Rd should be updated to the current symbol type "Stop Ahead" sign (W3-1).

Long Term considerations

If the short term sight distance and signing improvements do not reduce the number of right angle accidents at the intersection, the construction of a roundabout could be an effective solution to the intersections needs. The use of an 80' diameter Compact Roundabout would minimize right-of-way and utility impacts, but would require a truck restriction, as that size roundabout would not support tractor trailer traffic unless the central island is flush with the truck apron. A 100' Single Lane Roundabout would support tractor trailers, but would increase the property and utility impacts.

3.0 Jones Road and Carr Road Intersection

3.1 Background Information

The Jones Road and Carr Road intersection (depicted to the right) is a 3-leg intersection with stop sign control for the Carr Rd southbound approach. Southbound there is a 150 foot long right turn lane, in addition to the left turn lane. Westbound and eastbound, there are single lanes from which all through and turn movement are made.

Carr Road is posted with a 40 mph speed limit. Jones Road is also posted at 40 mph, but in the vicinity of the intersection a school speed limit of 30 mph between the weekday hours of 7:00 AM and 6:00 PM is also posted. As the roadway peak hours fall within this period, the 30 mph speed limit will typically govern during the busiest traffic periods. In addition, the intersection is located within a horizontal curve, and curve warning signs with a 25 mph advisory speed are posted on either side of the intersection.

Accident history was reviewed at this location as part of the 2015 Update to the Town of Wilton's Townwide Traffic Planning Study. In that study, it was found that 12 accidents occurred over the most recently reported 3-year period. This translated to an accident rate of 0.82 accidents per million entering vehicles (Acc/MEV), which is considerably higher (8 times) than the 0.10 acc/MEV statewide average for similar facilities.

To address operational and safety concerns at this location several investigations were conducted. These investigations included a review of sight distance, roadway geometry, accident history, existing signage and traffic control. A signal warrant analysis was also conducted, and geometric improvement concepts were developed. These tasks are detailed below.

3.2 Accident Review

As mentioned above, 12 accidents were noted at this location in the 3-year period between January 1, 2011 and December 31, 2013. These accidents were split somewhat evenly between rear end, right angle and fixed object (see accident diagram in Appendix A). Possible factors for these type accidents typically include limited sight lines, insufficient advance warning of the intersection, and/or traffic congestion sufficient enough to cause drivers to accept shorter than desirable gaps in traffic to make their movement. All these factors were reviewed as part of the intersection investigation.

3.3 Sight Distance Review

Sight Distance measurements at the Jones Rd and Carr Rd intersection were conducted in September 2015, using the guidelines detailed in AASHTO's *A Policy on Geometric Design of Highways and Streets*, 2011. During that time, the sight distance from Carr Road was noted as more than 1,000 feet in either direction. Based on the AASHTO publication for a 40 mph design speed, 445 feet should be sufficient for safe operations at an intersection, which is more than satisfied at this location. For vehicles on Jones Road turning left onto Carr Road sight distance is somewhat limited prior to arriving at the intersection but at the decision point there is adequate sight distance to select a safe gap in traffic to turn. As such, intersection sight distance does not appear to be an issue.

3.4 Signage Review

Signage surrounding the Jones Rd and Carr Rd intersection was reviewed in the field, and its notes that there are "Curve" warning signs (MUTCD Sign Number W1-2) with 25 mph advisory speed panels on either side of the horizontal curve in which Carr Road is located. The *Manual on Uniform Traffic Control Devices* (MUTCD), 2009 recommends the use of "Turn" Warning signs (W1-1) where advisory speed in 30 mph or less. As such, it is recommended that these sign panels be replaced with the W1-1 signs to make drivers more aware of the reduced speed condition.

W1-1

This signing recommendation will bring more awareness to the traffic conditions, which may address the right angle accidents at this intersection.

3.5 Intersection Traffic Control Review

Traffic control at the intersection is maintained through the use of stop sign control on Carr Road. Analyses were performed to determine the capacity and level of service of the present condition and to investigate the potential for a change in traffic control to either a traffic signal or roundabout. For these investigations, traffic volumes from various sources were compiled and adjusted by an annual growth rate to develop 2015 existing condition traffic volumes.

3.5.1 Level of Service Analysis

As stated earlier, operating conditions were evaluated using the methodologies contained in *the Highway Capacity Manual* (HCM 2010), published by the Transportation Research Board. Using the 2015 traffic volumes projected from past traffic count data, the PM peak hour level of service at the Jones Road and Carr Rd intersection is as follows:

- Eastbound Left: LOS A (9.2 sec/veh delay) (v/c=0.27)
- Southbound Left: LOS F (373.2 sec/veh delay) (v/c=1.63)

- Southbound Right: LOS B (11.0 sec/veh delay) (v/c=0.13)

All other movements at the intersection would not typically experience any delay and will operate at LOS A. Of the movements that do experience delay, it appears that the southbound left turn movement operates below acceptable levels, and experiences heavy delays and occasional over-capacity conditions. See Appendix B for the capacity analysis worksheet for this intersection.

3.5.2 Signal Warrant Analysis

Similar to the warrant analysis conducted for the Northern Pines Rd and Carr Rd intersection, the following applicable signal warrants were reviewed for the Jones road and Carr Rad intersection:

- Warrant 1: 8 hour traffic volumes
- Warrant 2: 4 hour traffic volumes
- Warrant 3: Peak hour traffic volume
- Warrant 7: Crash Experience

A warrant analysis was performed for this location and the results indicated that none of the three warrants reviewed were satisfied. The warrant analysis worksheet detailing this investigation is located in Appendix C of this report. Given that the movements at this intersection are not above capacity and there were no signal warrants satisfied, it is not recommended to install a traffic signal at this location.

3.5.3 Summary of Needs and Deficiencies

A review of the engineering investigations indicates the following:

- The recent accident/crash history is significantly higher than the statewide average for similar intersections
- Traffic signs at the intersection do not meet current MUTCD guidelines.
- Significant delays are experienced on the Carr Road approach.
- Available traffic data indicates a traffic signal is not warranted as delays are mostly limited to peak hours.

3.5.4 Roundabout Considerations

A roundabout is a suitable alternative to the needs at this intersection as it provides more protection from right angle accidents and reduces the severity of accidents when they do occur. For this location, two roundabout options were considered; (1) an Urban Compact Roundabout with 80 foot inscribed diameter and (2) an Urban Single Lane Roundabout with 100 foot inscribed diameter. Concept sketches for each of these configurations are included in Appendix E of this report.

Comparing the two options, both will provide acceptable levels of service, with an overall LOS B (13.0 sec/veh delay) and with no approach operating worse than LOS C with 16.3 sec/veh of delay in the PM peak hour. However, the impacts of each on utilities, right-of-way and truck traffic are different for each. These differences are outlined in the following table.

Jones Rd/Carr Rd - Roundabout Comparison Summary

Alternative	Max. Design Vehicle	Right-of-Way Impact	Utility Relocations
Compact (80' dia.)	Single Unit Truck/Bus	None	1 pole
Single Lane (100' dia.)	WB-50 Tractor Trailer	2 properties (0.055 acres)	1 pole

As the table shows, the 80' diameter roundabout has fewer impacts. However, it does not accommodate tractor trailer traffic. Traffic count data shows from 2014 indicated there was an average of one tractor trailer truck a day on Jones Road. If a compact roundabout was constructed, the road would need to be posted to restrict truck traffic and those tractor trailers would need to find an alternative route.

We have also reviewed the truck turning templates for both the Wilton and Greenfield fire trucks for use within both an 80 foot diameter and 100 foot diameter roundabouts. This review was performed user a program called Autoturn within our CADD software. For the review we used the fire truck specification data provided to us from the Town, created a truck template to simulate the truck turn movement characteristics for each type fire truck and projected those templates onto both size roundabouts. The results of our review revealed that both type fire trucks were able to traverse both the 100 foot and 80 foot diameter roundabouts within the roadway pavement. These trucks will not require any special truck apron or overhang area to move through the roundabout.

3.6 Findings & Recommendations (Jones Rd and Carr Rd)

Based on the investigations performed, the findings and recommendations for this intersection are as follows:

- Accident rate at this intersection is above the statewide average for similar locations, based on the accidents reported, right angle, rear end and fixed object accidents appear to be most prevalent.
- Sight distance is within acceptable limits at this location.
- The construction of a roundabout is feasible at this location but may require the acquisition of additional ROW depending on the size of the roundabout to be constructed.

Short Term Recommendations

- Signing near the intersection needs updating to meet current MUTCD standards.
- "Curve" signs (W1-2) should be changed to "Turn" signs (W1-1) on either side of the intersection along Jones Road.

Long Term considerations

If short term signing improvements do not reduce the number of right angle accidents at the intersection, in lieu of a traffic signal, the construction of a roundabout could be an effective solution to the intersections needs. An 80' diameter Compact Roundabout would minimize right-of-way and utility impacts, but would require a truck restriction, as that size roundabout would not support tractor trailer traffic unless the central island is flush with the truck apron. A 100' Single Lane Roundabout would support tractor trailers, but would increase property and utility impacts.

4.0 Carr Road Planning for Gavin Park Neighborhood Path

4.1 Background Information

The Gavin Park Neighborhood Path is a proposed 1.5 mile multi-purpose trail, the Town has hoped to construct along Northern Pines Road, Carr Road and Jones Road. The objective of the path is to provide walkers, joggers, bicyclists, and other forms of non-motorized travel a safe path to connect the residential areas in this portion of the Town to each other and to other significant sites such as the Dorothy Nolan elementary School, Gavin Park and the McGregor Links Country Club. Previous planning and preliminary design for the path as a whole was performed by TVGA Consultants in 2009, but the design along Carr Road was stalled because the alternative being progressed required cooperation of adjacent land owners, which wasn't able to be achieved, so the project was halted.

The purpose of this study is to review the feasibility of alternative path options along Carr Road to minimize Right-of-Way takings and utility impacts. For this study two options were considered:

- Option 1A: Multi-Use Path Construction on the West Side of Carr Road
- Option 1B: Multi-Use Path Construction on the East Side of Carr Road
- Option 2: Shoulder Widening on Carr Road to Allow Non-Motorized Travel adjacent to the roadway.

Though the construction of the multi-use path is the preferred option for bike and pedestrian safety and mobility, these options require more width to achieve and have greater impacts.

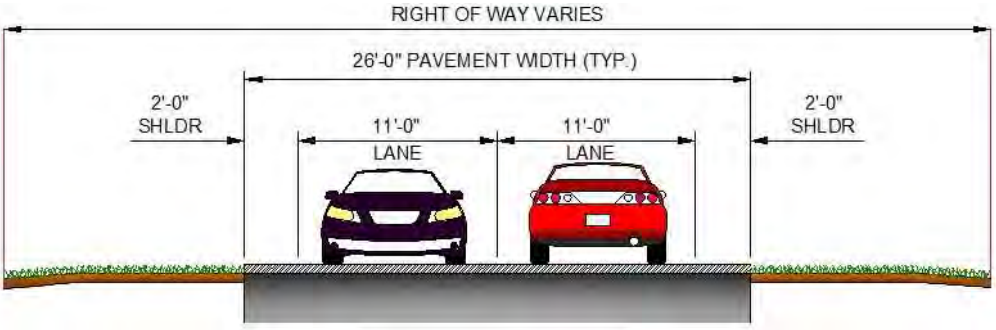
The options considered are discussed in more detail below.

4.2 Options 1A and 1B: Multi-Use Path

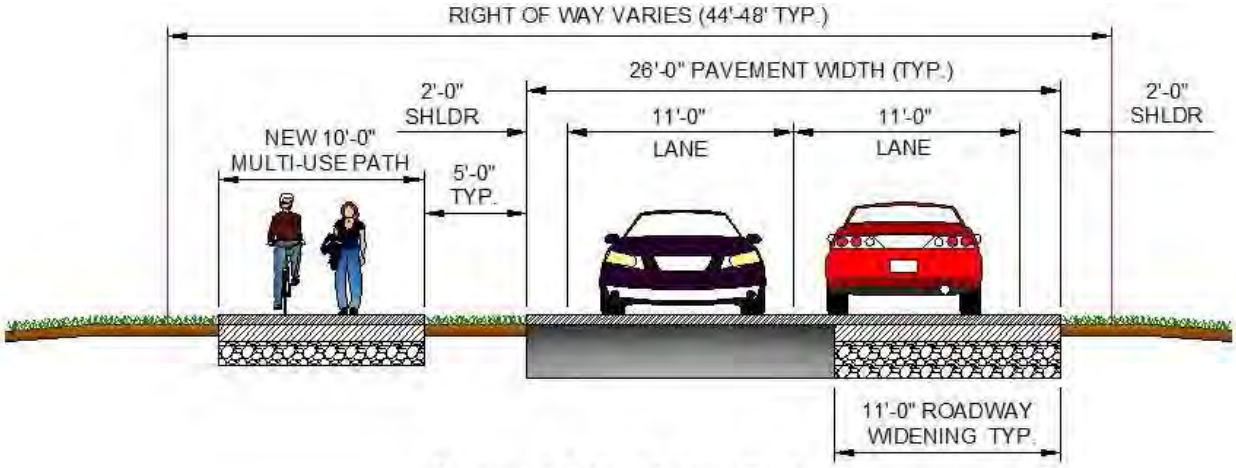
Construction of an adjacent multi-use path best meets the objectives of the Gavin Park Neighborhood Path project. However, right-of-way is limited along Carr Road and utility poles are located only a few feet off the pavement throughout the 2,700 foot length of the roadway. Previous design efforts proposed to place the path on the east side of the roadway, but because of issues with select property owners, that concept was rejected. As such a new concept, with the path located on the west side of the roadway was considered for this study. Additionally, the previous concept of constructing the path on the east side of Carr Road was revisited.

For the path planning, a conservative design was considered using standards considered desirable by NYSDOT and FHWA. As such a 10 foot wide path separated from the roadway by a 5 foot grass median was used as the design guideline for planning purposes. It may be possible to reduce the width of the path by 2 feet and minimally meet industry

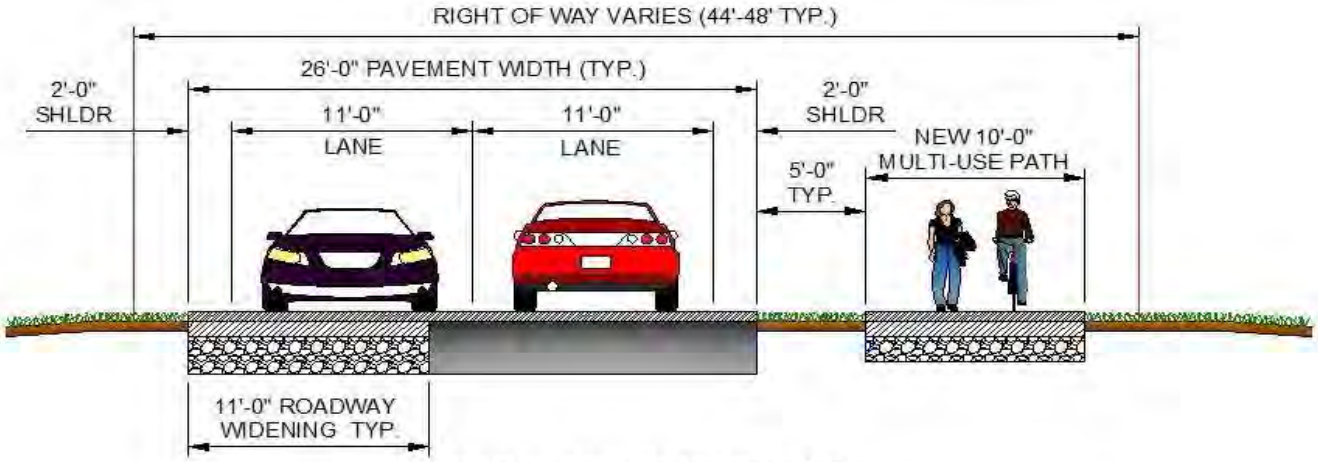
standards, but to provide the most conservative investigation of impacts only the desirable values were considered. Illustrations of the existing cross section of Carr Road and two options for locating the off road path are presented below:



Existing Carr Road
Cross Section



Option 1A Multi-Use Path
On West Side of Carr Road



Option 1B Multi-Use Path
On East Side of Carr Road

As the cross sections show, the roadway needs to be shifted to allow enough room for the path to be constructed within the right-of-way. Both options 1A and 1B have the same impacts as follows:

- Most of the overhead utility network, which includes 18 poles will need relocation.
- The removal of three large caliper trees.
- Right-of-way takings on two properties on the west side of the roadway near the Jones Road intersection.
- Required utility easements on approximately 12 separate properties, as most of the relocated utility poles cannot be accommodated within the right-of-way.
- The relocation of one telephone stanchion/splice box.

Additionally, Option 1A requires users to cross Carr Road at both Northern Pines Road and Jones Road in order to access the path. These new crosswalks will push stop bars father from the intersection and may exacerbate sight distance concerns. This concern would be eliminated if roundabouts were constructed at the intersections. Option 1B does not require path users to cross Carr road twice and is consistent with the previous planning efforts.

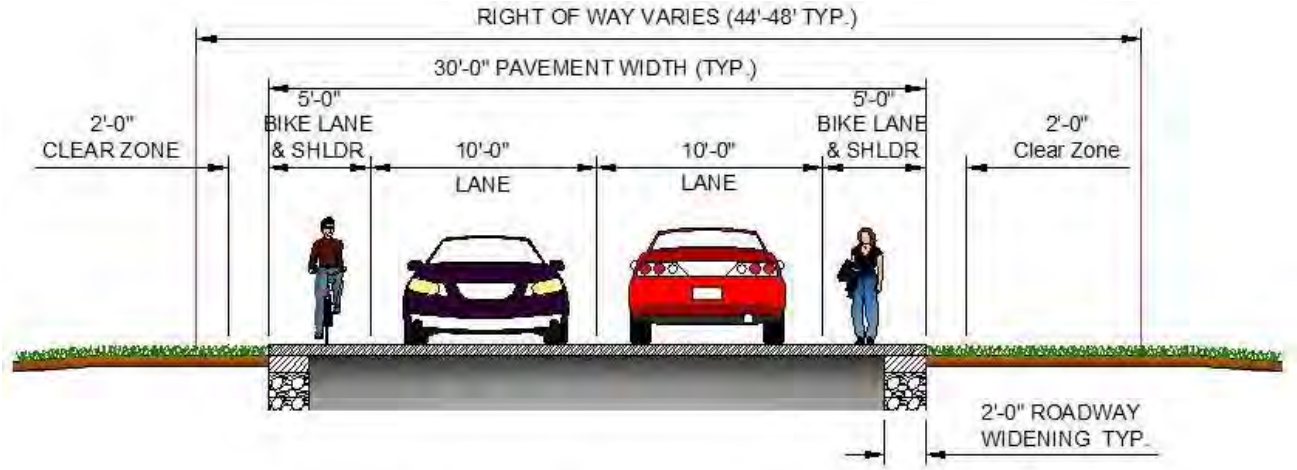
4.3 Option 2: Shoulder Widening to provide a Bike Path

Option 2 widens the existing pavement by 2 feet on both sides of Carr Road and narrows the existing travel lanes from 11 feet to 10 feet to provide a 5 foot wide bike lane on both sides of Carr Road. This option, illustrated on the next page provides sufficient width for bicyclist or pedestrians to travel along the side of the road. Conceptual layout plans for Option 2 are included in Appendix G.

As the graphic shows, there is much more width within the right-of-way available than in Options 1A and 1B. This allows more room for relocated utility poles, so fewer easements are necessary, and the road construction costs are significantly less because the roadway does not need to shift. The following is a summary of the impacts of this option:

- The possible relocation of up to 15 utility poles.
- The removal of two large caliper trees.
- Right-of-way takings on two properties. These are the same two west side properties as Option 1 and the takings are necessary only because of the lane widening at the Jones Road intersection. If a roundabout were constructed at the Jones road intersection, these takings may not be necessary.
- Utility easements on approximately 4 separate properties to accommodate utility pole relocations.
- The relocation of one telephone stanchion/splice box.
- Requires users to cross Carr Road at both Northern Pines Road and Jones Road in

order to travel on the west side of the roadway. These new crosswalks at these intersections will push stop bars father from the intersection and may exacerbate sight distance concerns.



Option 2 Roadway Section
To Accommodate Non-Motorized Users on Shoulder

Overall Option 2 results in reduced costs and impacts than for Option 1A and 1B but it provides a reduced function for non-motorized travel.

The table on the next page summarizes the impacts and relative functionality and costs of the Carr Road non-motorized options for Carr Road.

Carr Rd – Review of Non-Motorized Options

Option	Utility Poles to be moved	Utility Easements Needed	ROW Impacts	Road Crossings*	Large Trees Impacted	Function	Relative Cost
Existing Condition	0	0	0	NA	0	Poor	0
Option 1A – Trail on West Side	18	14	2	2	3	Fair	$$$
Option 1B – Trail on East Side	18	14	2	0	3	Good	$$$
Option 2 – Add Shoulders	15	4	2	2**	2	Fair	$

* To follow path identified in Gavin Park Path Feasibility Study

** Only southbound users need to cross

5.0 Planning Level Cost Estimates and Funding Options

To assist the Town with deciding on a direction for the locations analyzed as part of this effort, planning level cost estimates were developed for the options presented. As no detailed designs have been prepared these estimates must be considered very preliminary and could vary significantly from the actual cost due to changes in the design concept, design standard and unforeseen conditions. The main use of these planning level estimates is to establish a relative comparison of costs between the options examined. With that qualification the following planning level construction cost estimates are offered:

Carr Road and Northern Pines Road (includes allowance for utilities and ROW):

100 foot diameter roundabout:	$ 1 Million
80 foot diameter roundabout:	$ 750K

Carr Road and Jones Road (includes allowance for utilities and ROW):

100 foot diameter roundabout:	$ 1 Million
80 foot diameter roundabout:	$ 750K

Gavin Path Construction on Carr Road (Options 1A and 1B)

10 foot path construction:	$ 300K
Carr Road reconstruction/shift	$1.25 Million
Utility relocation	$ 50K
Total	**$ 1.600 Million**

Gavin Park shoulder/bike path reconstruction (includes allowance for utilities and ROW): $600K

At this stage in the project development process an additional 25% should be budgeted for contingencies as well as planning and design costs.

Funding Options

1. Payment out of the Towns' General Fund;
2. Bonding;
3. Use of Traffic Mitigation fee funds;

4. Successful award of Federal and/or NYSDOT funds (Transportation Alternatives Program (TAP), Safe Routes to School etc.);
5. Placing the desired project on the Capital District Transportation Committee Transportation Improvement Program (TIP) through the next a competitive solicitation for projects.

The use of Federal/NYSDOT funding typically requires a local (Town) match and following the NYSDOT procedures for competing transportation projects. A typical match is 20% of the total project costs. However, many projects do receive state funding of 15% and the local match is then reduced to 5%. Since Northern Pines Road (CR34) is a listed as a Federal Aid Highways under any planned improvements can be eligible for federal funds. Also since Northern Pines Road is under the jurisdiction of Saratoga County, they may be a willing partner in any improvement at its intersection with Carr Road.

6.0 Summary & Conclusion

The studies and analyses discussed in this Traffic Engineering Report outline the existing conditions, needs, and possible mitigation solutions at two intersections and examined options for providing a non-motorized option along Carr Road. Based on the analysis the following is a summary of the options athat ate at each of these locations include the following:

Northern Pines Road & Carr Road

- Clear trees and vegetation within the right-of-way to improve sight lines. Current sight distance appears to be minimally adequate, but depending on the vegetation overgrowth could become compromised.
- Replace "Curve" warning sign panels on Northern Pines Road (CR34) with "Turn" (W1-1) warning sign panels.
- Replace "Stop Ahead" text-only warning sign on Carr Road with current symbol type sign (W3-1).
- Though signal warrants are not satisfied at this location, the installation of a roundabout would eliminate the high right angle accident rate found at this intersection. A 100 foot minimum inscribed diameter would be necessary for the roundabout to accommodate tractor trailer traffic.

Jones Road & Carr Road

- Replace "Curve" warning sign panels with "Turn" (W1-1) warning sign panels.
- Though signal warrants are not satisfied at this location, the installation of a roundabout would eliminate the high right angle accident rate found at this intersection. A 100 foot minimum inscribed diameter would be necessary for the roundabout to accommodate tractor trailer traffic.

Carr Road Planning for Gavin Park Path

- Three options for Carr Road were considered as part of this study:
  1A. Multi-use path on the west side of the roadway
  1B. Multi-use path on the east side of the roadway
  2. Shoulder widening along the roadway to allow for pedestrian and bike use.

- Option 1A and 1B issues include:
  - Complete reconstruction of the roadway with a centerline shift required.
  - Complete relocation of overhead utility network to include up to 18 possible pole relocations will likely be required.
  - Removal of up to three large caliper trees will likely be required.
  - Right-of-way takings will be required on two properties on the west side of

the road near the Jones Road Intersection.
    - Utility Easements will likely be required on 12 separate properties.
    - Relocation of a telephone stanchion for underground telephone utility lines will likely be required.
- Unlike Option 1, Option 2 will not require road realignment and the issues are much less significant. These issues include:
    - Up to 15 possible utility pole relocations.
    - Removal of two large caliper trees may be required.
    - Right-of-way takings may be required on two properties on the west side of the road near the Jones Road intersection. However, installation of a roundabout at Jones Road may eliminate the need for these takings.
    - Utility Easements may be required on 4 separate properties.
    - Relocation of a telephone stanchion for underground telephone utility lines may be required.

Of the three options, Options 1A and 1B allows for a more protected facility for pedestrians and bicycles, removing them from the vehicular travel way, but it is far more costly than Option 2. In Option 1A, crosswalks will need to be installed at both the Jones Road and the Northern Pines Road intersections. This will require the stop bars to be pushed back farther away from the intersection, which may affect sight distance at these locations. However, if roundabouts are constructed at these locations, this issue is eliminated. Option 2 can provide a lower level of functionality for bikes and pedestrians at significantly less cost and impacts to adjacent properties.

Conclusions/Next Steps

The decision on the best options for Carr Road and its intersections with Northern Pines and Jones Roads will have to consider the following:

- The Towns current vision for providing non-motorized transportation throughout the Town and the priority for this area;
- The planning and engineering analyses (presented in this report);
- The community acceptance of the existing conditions;
- The community acceptance of the alternatives examined;
- The availability funds to construct the improvements.

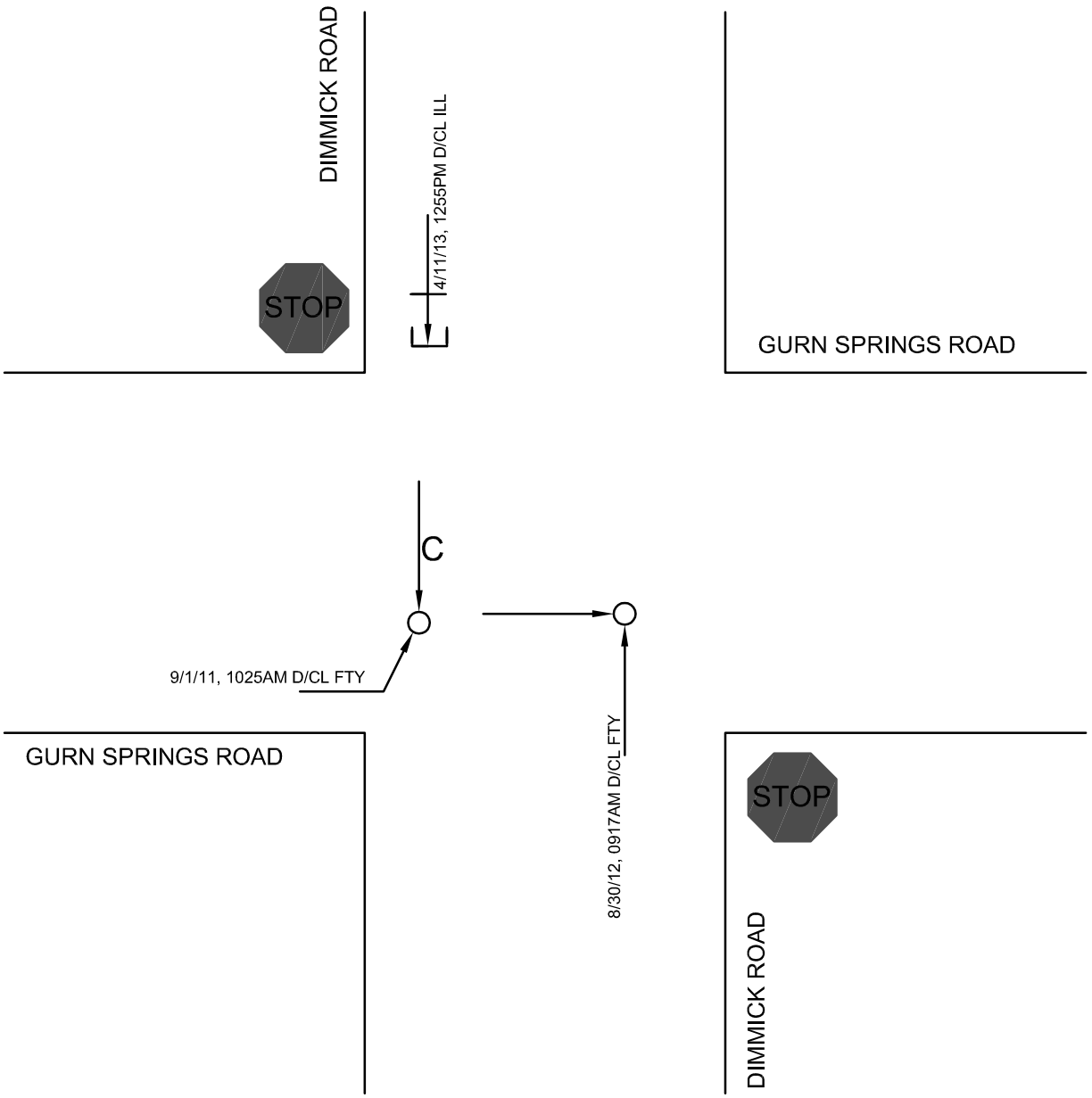
This Report provides the basis for Town of Wilton to test the community acceptance of the alternatives examined and to pursue outside funding streams for construction.

Appendices

A. Accident Diagrams
B. Capacity Analysis Worksheets (unsignalized and roundabout)
C. Signal Warrant Analysis Worksheets
D. Conceptual Northern Pines Rd and Carr Rd Roundabout Sketches
E. Conceptual Jones Rd and Carr Rd Roundabout Sketches
F. Conceptual Carr Rd Multi-Use Path Sketches
G. Conceptual Carr Rd Shoulder Widening Sketches

APPENDIX A

Collision Diagrams



LEGEND

ILL- ILLNESS	PERSONAL INJURY
C- BICYCLE	PROPERTY DAMAGE
FTY- FAILURE TO YIELD	FIXED OBJECT
CL- CLEAR	NON-REPORTABLE
D- DRY	

GURN SPRINGS RD & DIMMICK RD

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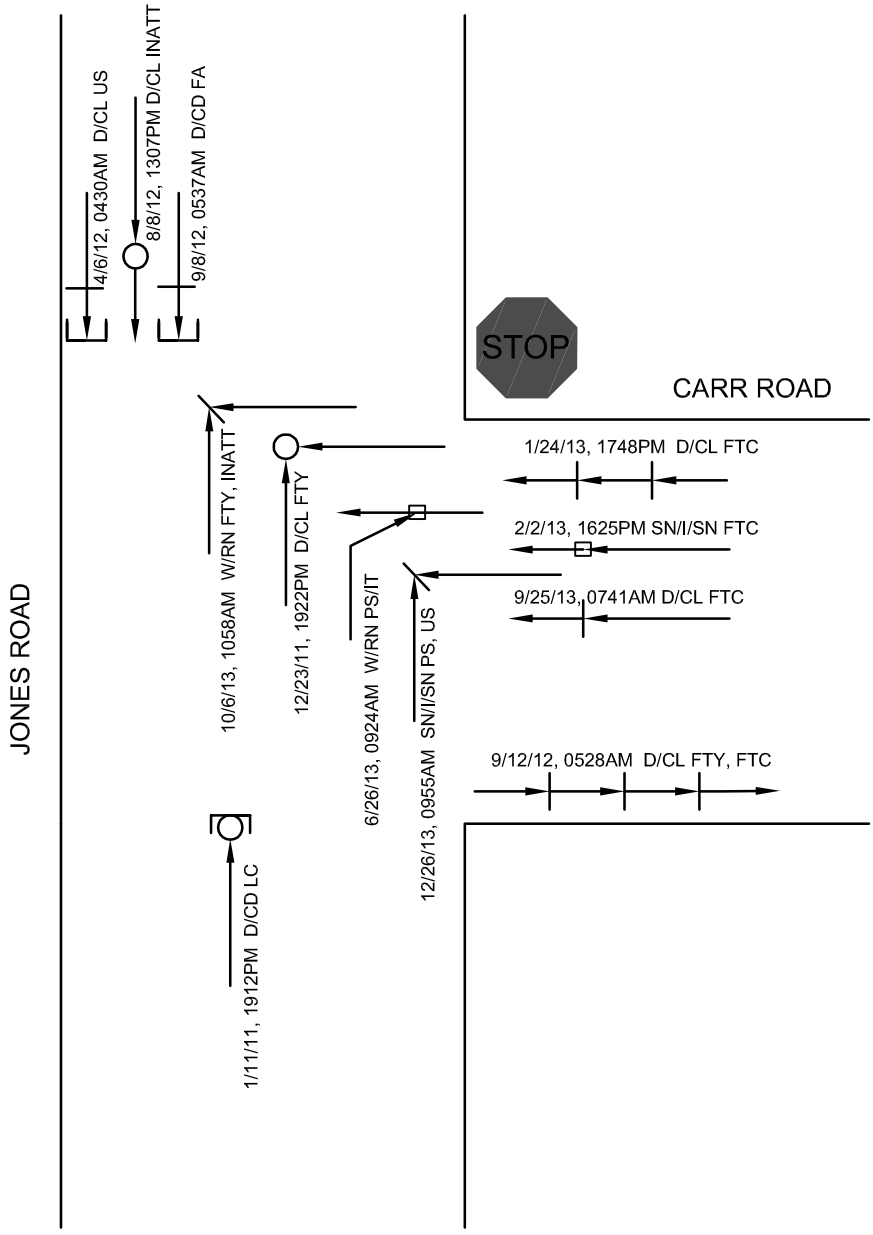
www.gpinet.com

TOWN OF WILTON TRAFFIC IMPACT STUDY 2014 UPDATE
TOWN OF WILTON, NEW YORK

PROJECT NO. 2014028.00 | DATE: SEPTEMBER 2014 | FIGURE NO. 1



LEGEND

FTY- FAILURE TO YIELD	LC- LOST CONSCIENCE	SN- SNOW	○ PERSONAL INJURY
INATT- INATTENTIVE	PS- PAVEMENT SLIPPERY	CL- CLEAR	□ NON-REPORTABLE
FTC- FOLLOW TOO CLOSELY	W- WET PAVEMENT	R- RAIN	
IT- IMPROPER TURNING	D-DRY PAVEMENT	[FIXED OBJECT	
US- UNSAFE SPEED	SN/I- SNOW/ICE	— PROPERTY DAMAGE ONLY	

JONES ROAD & CARR ROAD

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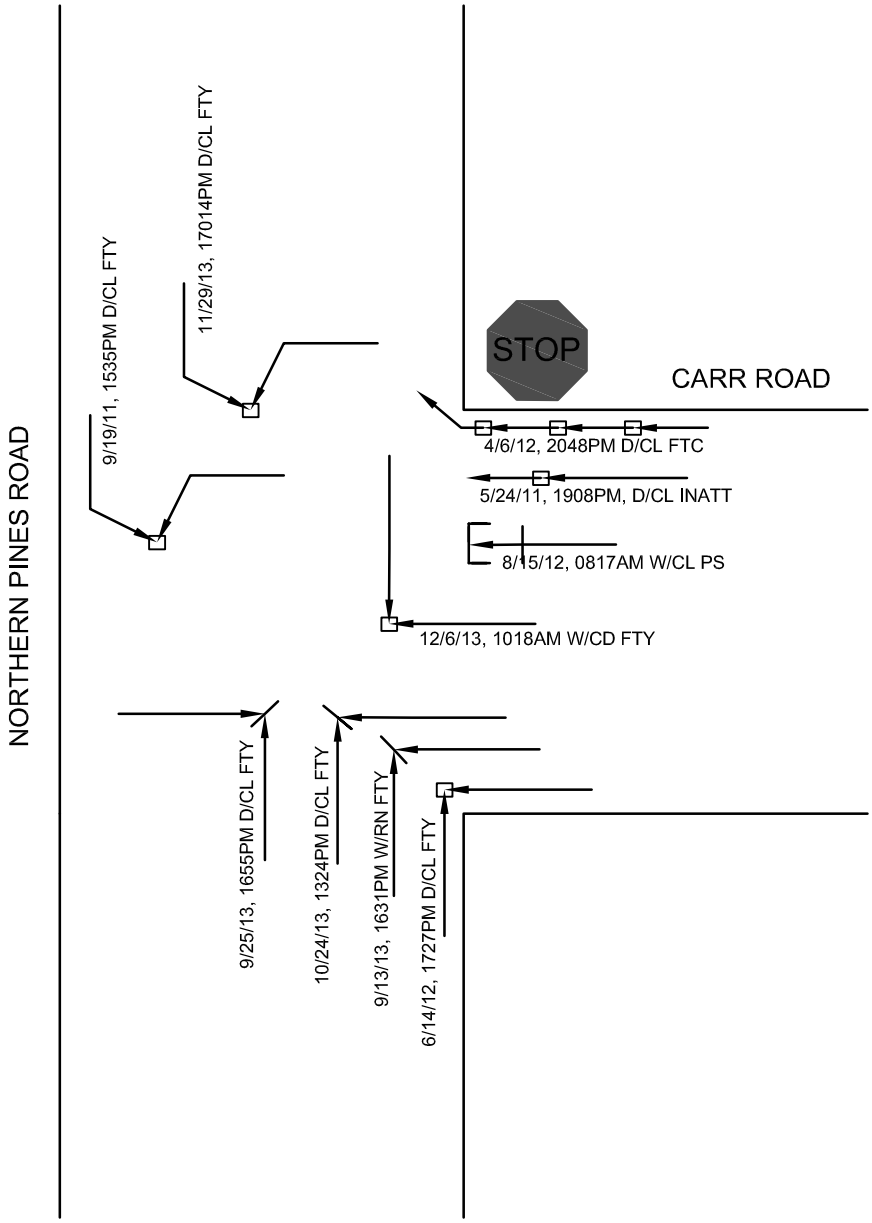
www.gpinet.com

TOWN OF WILTON TRAFFIC IMPACT STUDY 2014 UPDATE
TOWN OF WILTON, NEW YORK

PROJECT NO. 2014028.00 | DATE: SEPTEMBER 2014 | FIGURE NO. 2



LEGEND

FTY- FAILURE TO YIELD	W- WET PAVEMENT	□ NON-REPORTABLE
INATT- INATTENTIVE	CL- CLEAR	○ PERSONAL INJURY
FTC- FOLLOW TOO CLOSELY	CD- CLOUDY	
PS-PAVMENT SLIPPERY	— PROPERTY DAMAGE	
D- DRY PAVEMENT	[FIXED OBJECT	

N. PINES ROAD & CARR ROAD

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TOWN OF WILTON TRAFFIC IMPACT STUDY 2014 UPDATE
TOWN OF WILTON, NEW YORK

PROJECT NO. 2014028.00	DATE: SEPTEMBER 2014	FIGURE NO. 5

APPENDIX B
Capacity Analysis Worksheets
(unsignalized and roundabout)

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: GPI
Agency/Co.: Wilton
Date Performed: 9/17/2015
Analysis Time Period: PM Peak
Intersection: N. Pines/Carr
Jurisdiction: Town
Units: U. S. Customary
Analysis Year: 2015
Project ID: Wilton Studies (2015200.00)
East/West Street: Northern Pines
North/South Street: Carr Rd
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		286	89	169	176	
Peak-Hour Factor, PHF		0.90	0.90	0.90	0.90	
Hourly Flow Rate, HFR		317	98	187	195	
Percent Heavy Vehicles		--	--	2	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes		1	0	1	1	
Configuration			TR	L	T	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	140		270			
Peak Hour Factor, PHF	0.90		0.90			
Hourly Flow Rate, HFR	155		300			
Percent Heavy Vehicles	2		2			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/
Lanes	1		1			
Configuration	L		R			

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		L	L		R			
v (vph)		187	155		300			
C(m) (vph)		1144	247		679			
v/c		0.16	0.63		0.44			
95% queue length		0.58	3.80		2.27			
Control Delay		8.8	41.3		14.4			
LOS		A	E		B			
Approach Delay				23.6				
Approach LOS				C				

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: GPI
Agency/Co.: Wilton
Date Performed: 10/7/2015
Analysis Time Period: PM Peak
Intersection: Jones/Carr
Jurisdiction: Town
Units: U. S. Customary
Analysis Year: 2015
Project ID: Wilton Studies (2015200.00)
East/West Street: Jones Rd
North/South Street: Carr Rd
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	148	174			187	381
Peak-Hour Factor, PHF	0.90	0.90			0.90	0.90
Hourly Flow Rate, HFR	164	193			207	423
Percent Heavy Vehicles	1	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				192		78
Peak Hour Factor, PHF				0.90		0.90
Hourly Flow Rate, HFR				213		86
Percent Heavy Vehicles				1		1
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/
Lanes				1		1
Configuration				L		R

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT					L		R
v (vph)	164					213		86
C(m) (vph)	957					244		637
v/c	0.17					0.87		0.14
95% queue length	0.62					7.21		0.47
Control Delay	9.5					72.5		11.5
LOS	A					F		B
Approach Delay							55.0	
Approach LOS							F	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: GPI
Agency/Co.: Wilton
Date Performed: 10/7/2015
Analysis Time Period: PM Peak
Intersection: Jones/Carr
Jurisdiction: Town
Units: U. S. Customary
Analysis Year: 2015
Project ID: Wilton Studies (2015200.00)
East/West Street: Jones Rd
North/South Street: Carr Rd
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	148	174			187	381
Peak-Hour Factor, PHF	0.90	0.90			0.90	0.90
Peak-15 Minute Volume	41	48			52	106
Hourly Flow Rate, HFR	164	193			207	423
Percent Heavy Vehicles	1	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume				192		78
Peak Hour Factor, PHF				0.90		0.90
Peak-15 Minute Volume				53		22
Hourly Flow Rate, HFR				213		86
Percent Heavy Vehicles				1		1
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		/
RT Channelized?						No
Lanes				1		1
Configuration				L		R

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	12.0	12.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	193	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1					7.1		6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	1					1		1
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	0.00	0.00	0.00
t(3,lt)	0.00					0.70		0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.1					6.4		6.2
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	1					1		1
t(f)	2.2					3.5		3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	630					939		418
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						1500		
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.					9		12	
Conflicting Flows							418	
Potential Capacity							637	
Pedestrian Impedance Factor					1.00		1.00	
Movement Capacity							637	
Probability of Queue free St.					1.00		0.86	
Step 2: LT from Major St.					4		1	
Conflicting Flows							630	
Potential Capacity							957	
Pedestrian Impedance Factor					1.00		1.00	
Movement Capacity							957	
Probability of Queue free St.					1.00		0.83	
Maj L-Shared Prob Q free St.							0.81	
Step 3: TH from Minor St.					8		11	
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor					1.00		1.00	
Cap. Adj. factor due to Impeding mvmnt					0.81		0.81	
Movement Capacity								
Probability of Queue free St.					1.00		1.00	
Step 4: LT from Minor St.					7		10	
Conflicting Flows							939	
Potential Capacity							294	
Pedestrian Impedance Factor					1.00		1.00	
Maj. L, Min T Impedance factor					0.81			
Maj. L, Min T Adj. Imp Factor.					0.85			
Cap. Adj. factor due to Impeding mvmnt					0.74		0.83	
Movement Capacity							244	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.					8		11	
Part 1 - First Stage								
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor								
Cap. Adj. factor due to Impeding mvmnt								
Movement Capacity								
Probability of Queue free St.								

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.81	0.81
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		939
Potential Capacity		294
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.81	
Maj. L, Min T Adj. Imp Factor.	0.85	
Cap. Adj. factor due to Impeding mvmnt	0.74	0.83
Movement Capacity		244
Results for Two-stage process:		
a		
y		
C t		244

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				213		86
Movement Capacity (vph)				244		637
Shared Lane Capacity (vph)						

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep				244		637
Volume				213		86
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT					L		R
v (vph)	164					213		86
C(m) (vph)	957					244		637
v/c	0.17					0.87		0.14
95% queue length	0.62					7.21		0.47
Control Delay	9.5					72.5		11.5
LOS	A					F		B
Approach Delay							55.0	
Approach LOS							F	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.83	1.00
v(il), Volume for stream 2 or 5	193	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.81	
d(M,LT), Delay for stream 1 or 4	9.5	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	1.8	

Phone: Fax:
E-Mail:

ROUNDABOUT ANALYSIS

Analyst: GPI
Agency/Co.: Wilton
Date Performed: 10/7/2015
Analysis Time Period: PM Peak
Intersection: N. Pines/Carr
Jurisdiction: Town
Units: U. S. Customary
Analysis Year: 2015
Project ID: Wilton Studies (2015200.00)
East/West Street:
North/South Street:

Volume Adjustments and Site Characteristics

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume		286	89	169	176		140		270			
U-Turn Vol	0			0			0			0		
% Thrus Left Lane												

	Eastbound			Westbound			Northbound			Southbound		
	Left		Right	BP	Left		Right	BP	Left		Right	BP	Left		Right	BP
Lane Assn.	TR				LT				LR							
RT Bypass	None				None				None				None			
PHF	0.85	0.85	0.85		0.85	0.85	0.85		0.85	0.85	0.85		0.85	0.85	0.85	
%HV	1	1	1		1	1	1		1	1	1		1	1	1	
NumPeds	0				5				0				0			
U-Turn PHF	0.85				0.85				0.85				0.85			
U-Turn %HV	1				1				1				1			
Flow Rate	0	340	106		201	209	0		166	0	321		0	0	0	
No. Lanes	0	1	0		0	1	0		0	0	0		0	0	0	
Cnfl. Lanes	1				1				1				1			

Duration, T 0.25 hrs.

Critical and Follow-Up Headway Adjustment

	Eastbound			Westbound		
Crit. Hdwy	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929
	Northbound			Southbound		
Crit. Hdwy	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929
	Eastbound			Westbound		
Flup. Hdwy	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858
	Northbound			Southbound		
Flup. Hdwy	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858

Flow Computations

	Eastbound	Westbound	Northbound	Southbound
Circ. Flow	201	166	340	576
Exit. Flow	661	375	0	307

Capacity and Level of Service

	Eastbound	Westbound	Northbound	Southbound

	Left	Right	BP	Left	Right	BP	Left	Right	BP	Left	Right	BP
Entry Flow		446			410			487				
Entry Cap.		924			957			804			0	
Volume (vph)		442			406			482				
Cap. (vph)		915			947			796			0	
v/c Ratio		0.48			0.43			0.61				
Critical Lane		*			*			*				
Lane Delay		10.0			8.8			14.2				
Lane LOS		A			A			B				
95 % Queue		2.7			2.2			4.2				
Approach:												
Delay		9.96			8.77			14.25				
LOS		A			A			B				

Intersection Delay 11.15 Intersection LOS B

APPENDIX C

Signal Warrant Analysis Worksheets

TRAFFIC SIGNAL WARRANT SUMMARY

Project: Wilton Traffic Studies
Condition: 2015 Traffic Conditions - Northbound Left Only
Location: Saratoga County
Date: September 17, 2015

Major Street: Northern Pines Rd
Lanes: 1
Critical Approach Speed: 40 mph
Minor Street: Carr RD
Lanes: 1

Volume Level Criteria

1. Is the critical speed of major street traffic greater than 40 mph? No
2. Is the intersection in a built-up area of an isolated community with population less than 10,000? No

If either Question 1 or Question 2 is answered "Yes", then use the 70% volume level. Criteria used: 100%

WARRANT 1 - EIGHT HOUR VEHICULAR VOLUME **Warrant 1 Satisfied: NO**

Warrant 1 is satisfied if EITHER Condition A OR Condition B is 100% satisfied.
Warrant 1 is also satisfied if BOTH Condition A AND Condition B are satisfied to the 80% volume level.

			Condition 1A - Minimum Vehicular Volume (X indicates that criteria is met for specified condition)				Condition 1B - Interuption of Continuous Traffic (X indicates that criteria is met for specified condition)				Total Satisfied Hours (8 required)		
											0	0	3
Minimum Volume Criteria:			500	150	400	120	750	75	600	60	Condition 1A	Condition 1B	80% for Both
Start Time	Major St. Volume[1]	Minor St. Volume[2]	Major St. 100%	Minor St. 100%	Major St. 80%	Minor St. 80%	Major St. 100%	Minor St. 100%	Major St. 80%	Minor St. 80%	Satisfied	Satisfied	Satisfied
12:00 AM	23	15	-	-	-	-	-	-	-	-	-	-	-
1:00 AM	5	3	-	-	-	-	-	-	-	-	-	-	-
2:00 AM	13	2	-	-	-	-	-	-	-	-	-	-	-
3:00 AM	11	4	-	-	-	-	-	-	-	-	-	-	-
4:00 AM	30	3	-	-	-	-	-	-	-	-	-	-	-
5:00 AM	112	10	-	-	-	-	-	-	-	-	-	-	-
6:00 AM	307	27	-	-	-	-	-	-	-	-	-	-	-
7:00 AM	700	82	X	-	X	-	-	X	X	X	-	-	-
8:00 AM	650	75	X	-	X	-	-	X	X	X	-	-	-
9:00 AM	582	80	X	-	X	-	-	X	-	X	-	-	-
10:00 AM	491	95	-	-	X	-	-	X	-	X	-	-	-
11:00 AM	512	92	X	-	X	-	-	X	-	X	-	-	-
12:00 PM	535	100	X	-	X	-	-	X	-	X	-	-	-
1:00 PM	523	112	X	-	X	-	-	X	-	X	-	-	-
2:00 PM	569	110	X	-	X	-	-	X	-	X	-	-	-
3:00 PM	664	124	X	-	X	X	-	X	X	X	-	-	**1**
4:00 PM	718	140	X	-	X	X	-	X	X	X	-	-	**1**
5:00 PM	735	145	X	-	X	X	-	X	X	X	-	-	**1**
6:00 PM	537	123	X	-	X	X	-	X	-	X	-	-	-
7:00 PM	317	101	-	-	-	-	-	X	-	X	-	-	-
8:00 PM	259	81	-	-	-	-	-	X	-	X	-	-	-
9:00 PM	172	69	-	-	-	-	-	-	-	X	-	-	-
10:00 PM	92	38	-	-	-	-	-	-	-	-	-	-	-
11:00 PM	56	23	-	-	-	-	-	-	-	-	-	-	-

[1] Major Street Volume is the total combined volume of both mainline approaches.

[2] Minor Street volumes is the highest single side street approach volume.

WARRANT 2 - FOUR HOUR VEHICULAR VOLUME **Warrant 2 Satisfied: NO**

Warrant is satisfied if four (4) or more hours satisfy the volume requirements depicted on the four hour warranting graph **(see page 2)**. No. of Points Above Criteria Curve: 0

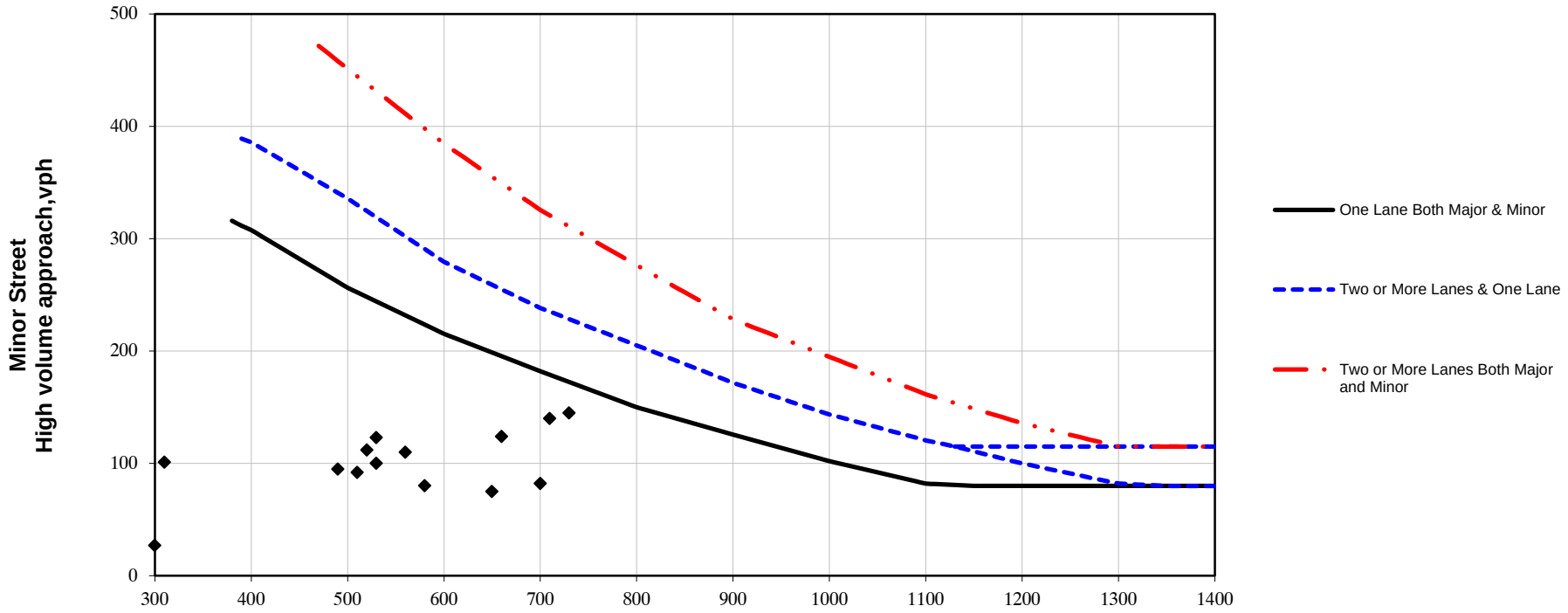
WARRANT 3 - PEAK HOUR VEHICULAR VOLUME **Warrant 3 Satisfied: NO**

Warrant is satisfied if any hour satisfy the volume requirements depicted on the peak hour warranting graph **(see page 3)**, and ALL three of the following requirement are met. No. of Points Above Criteria Curve: 0

1. Total stopped time delay on Minor Street equals or exceeds 4 VHD (single lane) or 5 VHD (two lanes): 2.7 VHD Max. NO
2. Volume on Minor Street equals or exceeds 100 vehicles (single lane) or 150 vehicles (two lanes): YES
3. Total intersection volume serviced during the hour equals or exceeds 650 veh. (3-leg) or 800 veh. (4-leg or more): YES

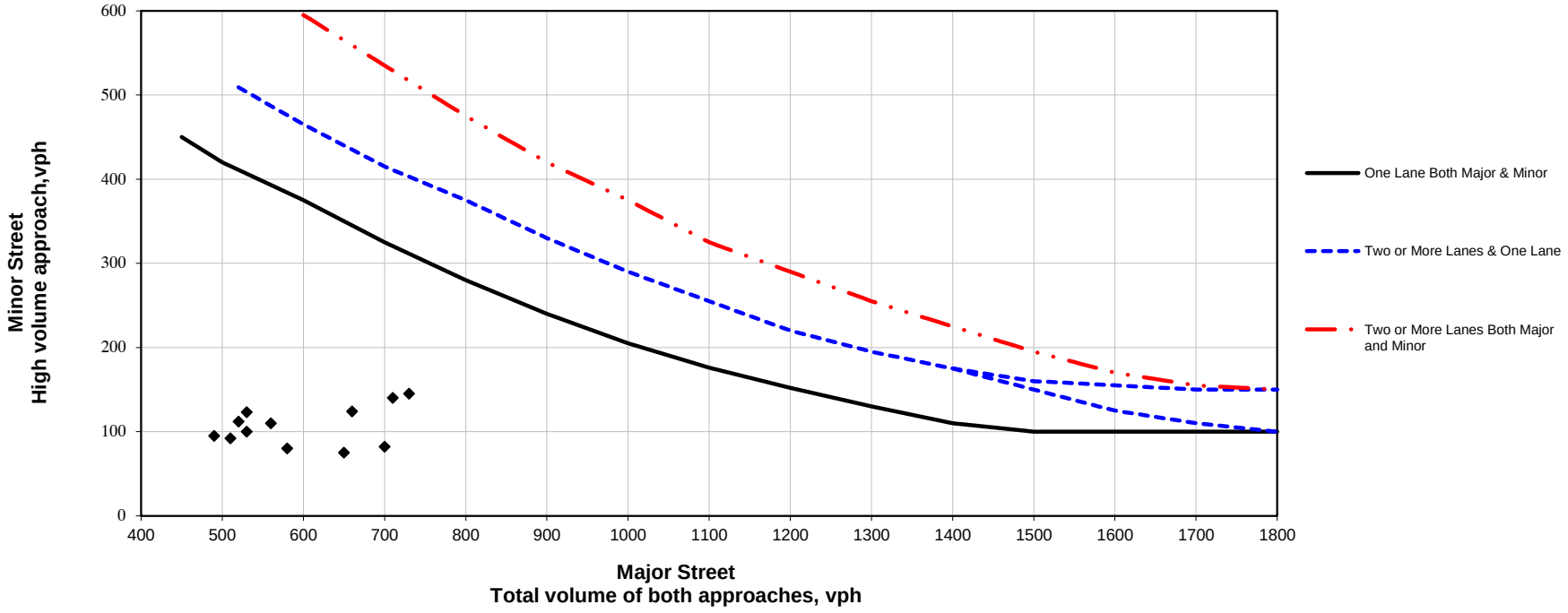
Criteria Source: Manual on Uniform Traffic Control Devices, 2009

Figure 4C-1. Warrant 2, Four-Hour Vehicular Volume



Note: Points on graph represent hourly volumes. Points above the respective curve satisfy warrant, points below do not satisfy warrant.

Figure 4C-3. Warrant 3, Peak Hour



Note: Points on graph represent hourly volumes. Points above the respective curve satisfy warrant, points below do not satisfy warrant.

TRAFFIC SIGNAL WARRANT SUMMARY

Project: Wilton Traffic Studies
Condition: 2015 Traffic Conditions - Southbound Lefts Only
Location: Saratoga County
Date: October 7, 2015

Major Street: Jones Rd Lanes: 1 Critical Approach Speed: 40 mph
Minor Street: Carr Rd Lanes: 1

Volume Level Criteria

1. Is the critical speed of major street traffic greater than 40 mph? No
2. Is the intersection in a built-up area of an isolated community with population less than 10,000? No

If either Question 1 or Question 2 is answered "Yes", then use the 70% volume level. Criteria used: 100%

WARRANT 1 - EIGHT HOUR VEHICULAR VOLUME **Warrant 1 Satisfied: NO**

Warrant 1 is satisfied if EITHER Condition A OR Condition B is 100% satisfied.
Warrant 1 is also satisfied if BOTH Condition A AND Condition B are satisfied to the 80% volume level.

			Condition 1A - Minimum Vehicular Volume (X indicates that criteria is met for specified condition)				Condition 1B - Interuption of Continuous Traffic (X indicates that criteria is met for specified condition)				Total Satisfied Hours (8 required)		
											4	1	4
Minimum Volume Criteria:			500	150	400	120	750	75	600	60	Condition	Condition	80% for
Start Time	Major St. Volume[1]	Minor St. Volume[2]	Major St. 100%	Minor St. 100%	Major St. 80%	Minor St. 80%	Major St. 100%	Minor St. 100%	Major St. 80%	Minor St. 80%	1A Satisfied	1B Satisfied	Both Satisfied
12:00 AM	33	4	-	-	-	-	-	-	-	-	-	-	-
1:00 AM	27	1	-	-	-	-	-	-	-	-	-	-	-
2:00 AM	14	1	-	-	-	-	-	-	-	-	-	-	-
3:00 AM	13	3	-	-	-	-	-	-	-	-	-	-	-
4:00 AM	23	11	-	-	-	-	-	-	-	-	-	-	-
5:00 AM	91	48	-	-	-	-	-	-	-	-	-	-	-
6:00 AM	216	134	-	-	-	X	-	X	-	X	-	-	-
7:00 AM	373	243	-	X	-	X	-	X	-	X	-	-	-
8:00 AM	415	221	-	X	X	X	-	X	-	X	-	-	-
9:00 AM	444	197	-	X	X	X	-	X	-	X	-	-	-
10:00 AM	412	156	-	X	X	X	-	X	-	X	-	-	-
11:00 AM	426	164	-	X	X	X	-	X	-	X	-	-	-
12:00 PM	455	174	-	X	X	X	-	X	-	X	-	-	-
1:00 PM	482	158	-	X	X	X	-	X	-	X	-	-	-
2:00 PM	481	167	-	X	X	X	-	X	-	X	-	-	-
3:00 PM	718	170	X	X	X	X	-	X	X	X	**1**	-	**1**
4:00 PM	726	198	X	X	X	X	-	X	X	X	**1**	-	**1**
5:00 PM	890	192	X	X	X	X	X	X	X	X	**1**	**1**	**1**
6:00 PM	713	150	X	X	X	X	-	X	X	X	**1**	-	**1**
7:00 PM	650	90	X	-	X	-	-	X	X	X	-	-	-
8:00 PM	423	51	-	-	X	-	-	-	-	-	-	-	-
9:00 PM	232	33	-	-	-	-	-	-	-	-	-	-	-
10:00 PM	105	17	-	-	-	-	-	-	-	-	-	-	-
11:00 PM	61	12	-	-	-	-	-	-	-	-	-	-	-

[1] Major Street Volume is the total combined volume of both mainline approaches.

[2] Minor Street volumes is the highest single side street approach volume.

WARRANT 2 - FOUR HOUR VEHICULAR VOLUME **Warrant 2 Satisfied: NO**

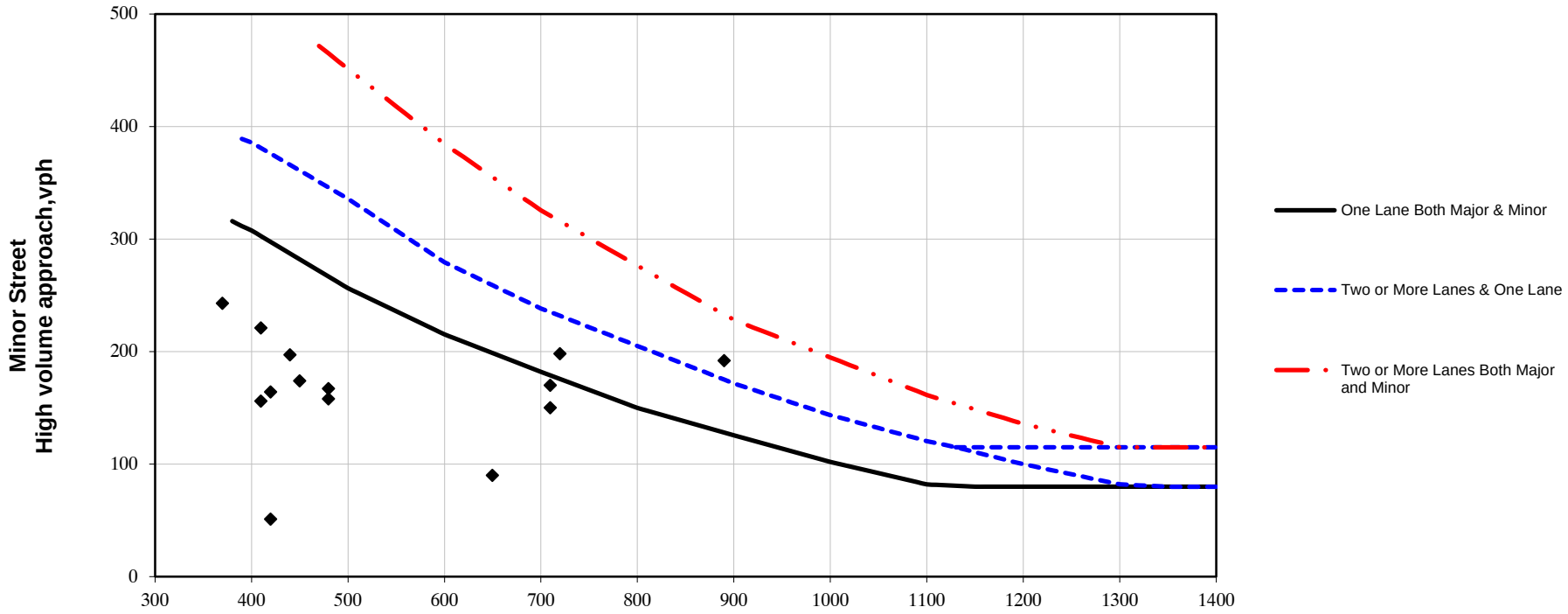
Warrant is satisfied if four (4) or more hours satisfy the volume requirements depicted on the four hour warranting graph **(see page 2)**. No. of Points Above Criteria Curve: 2

WARRANT 3 - PEAK HOUR VEHICULAR VOLUME **Warrant 3 Satisfied: NO**

Warrant is satisfied if any hour satisfy the volume requirements depicted on the peak hour warranting graph **(see page 3)**, and ALL three of the following requirement are met. No. of Points Above Criteria Curve: 0

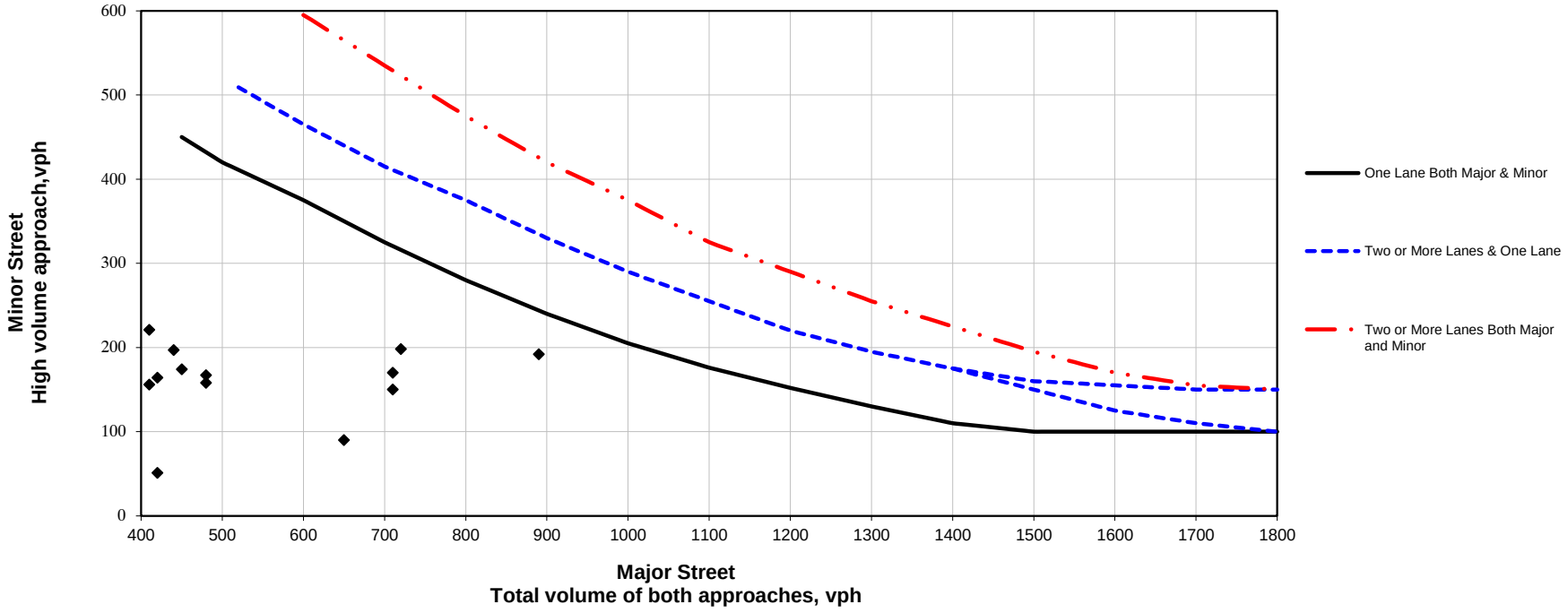
1. Total stopped time delay on Minor Street equals or exceeds 4 VHD (single lane) or 5 VHD (two lanes): 3.9 VHD Max. NO
2. Volume on Minor Street equals or exceeds 100 vehicles (single lane) or 150 vehicles (two lanes): YES
3. Total intersection volume serviced during the hour equals or exceeds 650 veh. (3-leg) or 800 veh. (4-leg or more): YES

Figure 4C-1. Warrant 2, Four-Hour Vehicular Volume



Note: Points on graph represent hourly volumes. Points above the respective curve satisfy warrant, points below do not satisfy warrant.

Figure 4C-3. Warrant 3, Peak Hour



Note: Points on graph represent hourly volumes. Points above the respective curve satisfy warrant, points below do not satisfy warrant.

APPENDIX D

Conceptual Roundabout Sketches

Northern Pines Rd and Carr Rd

Greenman-Pedersen
CONSULTING ENGINEERS
GPI
80 Wolf Road
Suite 300
Albany, NY 12205

2015 TRAFFIC ENGINEERING STUDIES
TOWN OF WILTON, NEW YORK

CARR RD AND NORTHERN PINES RD
URBAN ROUNDABOUT
100 FT DIA. CONCEPT SKETCH

JOB NO.	SCALE:	DATE:	FIGURE NO.
2015200.00	AS SHOWN	OCT. 2015	1 A

Greenman-Pedersen
CONSULTING ENGINEERS
GPI
80 Wolf Road
Suite 300
Albany, NY 12205

2015 TRAFFIC ENGINEERING STUDIES
TOWN OF WILTON, NEW YORK

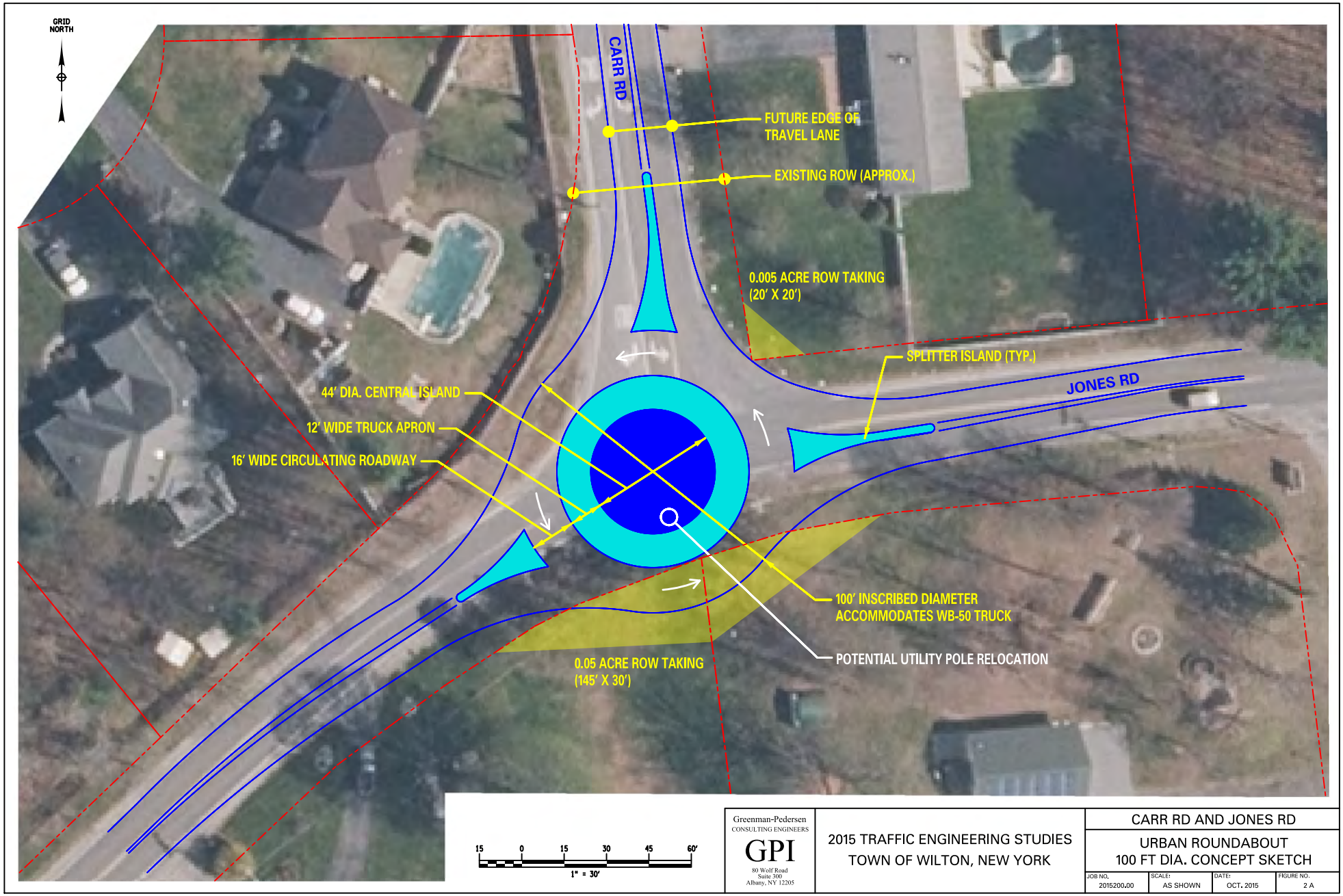
CARR RD AND NORTHERN PINES RD
URBAN ROUNDABOUT
80 FT DIA. CONCEPT SKETCH

JOB NO.	SCALE:	DATE:	FIGURE NO.
2015200.00	AS SHOWN	DEC. 2015	1 B

APPENDIX E

Conceptual Roundabout Sketches

Jones Rd and Carr Rd

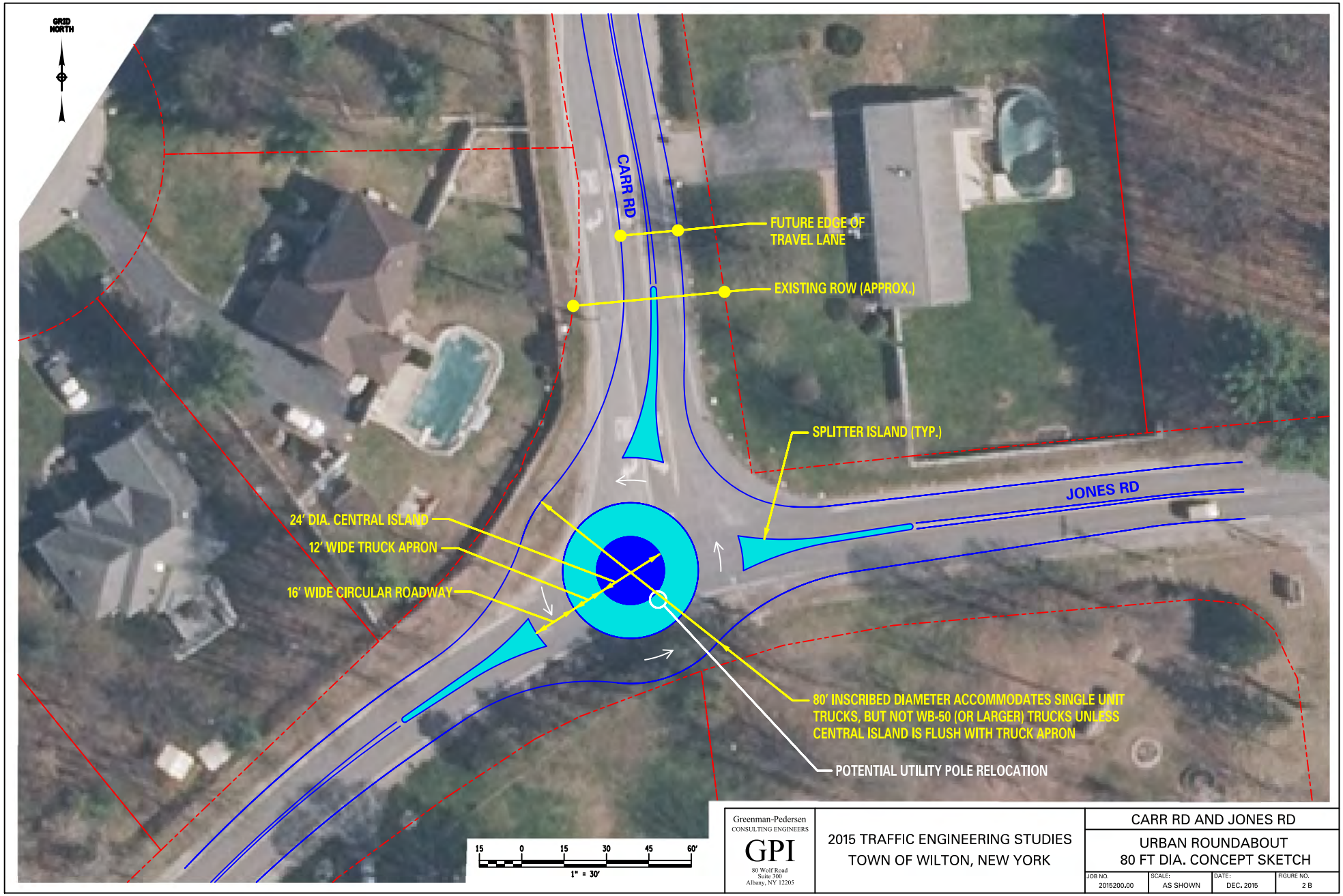


Greenman-Pedersen
CONSULTING ENGINEERS
GPI
80 Wolf Road
Suite 300
Albany, NY 12205

2015 TRAFFIC ENGINEERING STUDIES
TOWN OF WILTON, NEW YORK

CARR RD AND JONES RD
URBAN ROUNDABOUT
100 FT DIA. CONCEPT SKETCH

JOB NO.	SCALE:	DATE:	FIGURE NO.
2015200.00	AS SHOWN	OCT. 2015	2 A



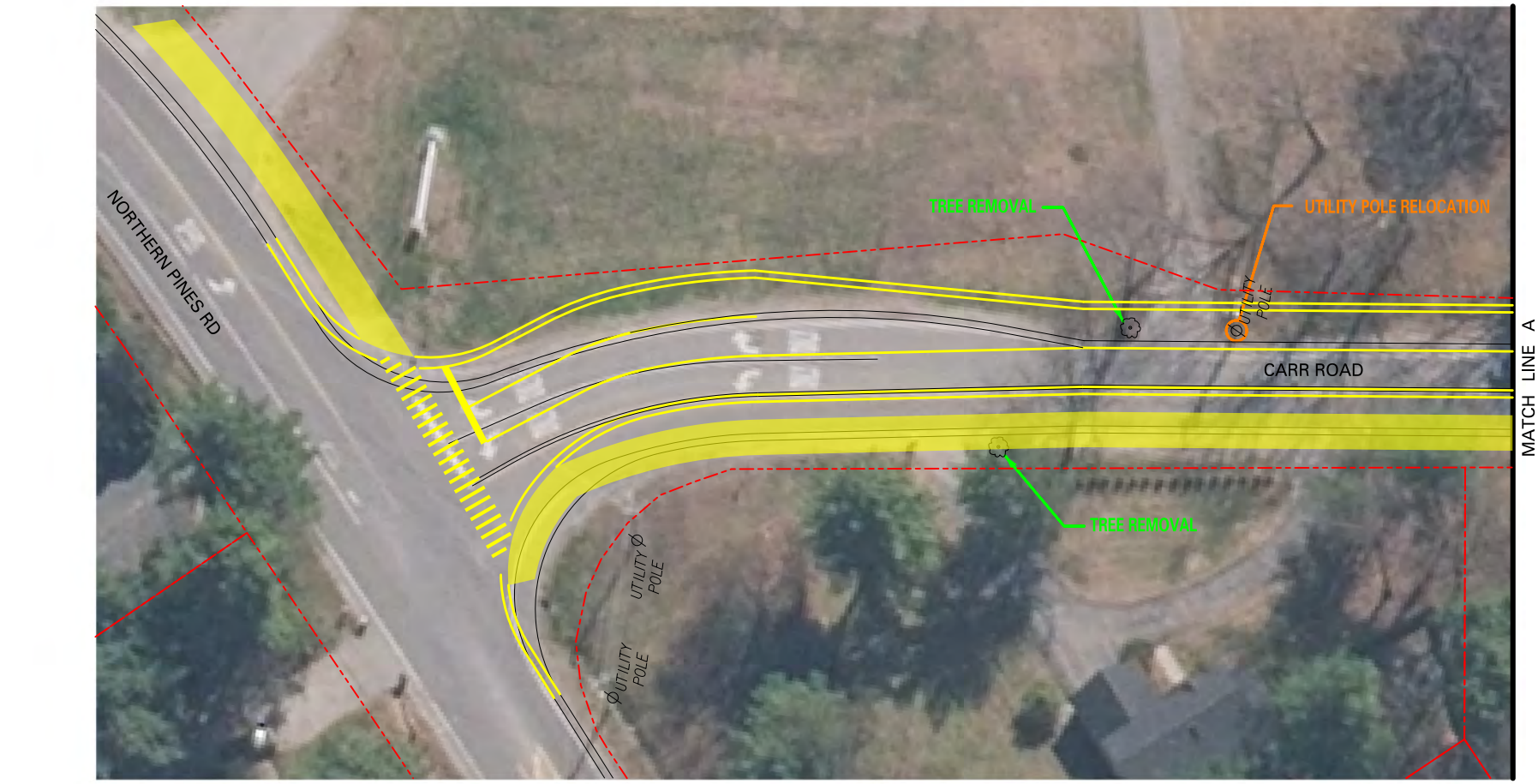
Greenman-Pedersen
CONSULTING ENGINEERS
GPI
80 Wolf Road
Suite 300
Albany, NY 12205

2015 TRAFFIC ENGINEERING STUDIES
TOWN OF WILTON, NEW YORK

CARR RD AND JONES RD
URBAN ROUNDABOUT
80 FT DIA. CONCEPT SKETCH

JOB NO.	SCALE:	DATE:	FIGURE NO.
2015200.00	AS SHOWN	DEC. 2015	2 B

APPENDIX F
Conceptual Multi-Use Path Sketches
Carr Road



15 0 15 30 45 60'
1" = 30'

Greenman-Pedersen
CONSULTING ENGINEERS
GPI
80 Wolf Road
Suite 300
Albany, NY 12205

2015 TRAFFIC ENGINEERING STUDIES
TOWN OF WILTON, NEW YORK

GAVIN PARK PATH PLANNING

CARR ROAD
MULTIUSE PATH CONCEPT

JOB NO.	SCALE:	DATE:	FIGURE NO.
2015200.00	AS SHOWN	OCT. 2015	1

15 0 15 30 45 60'
1" = 30'

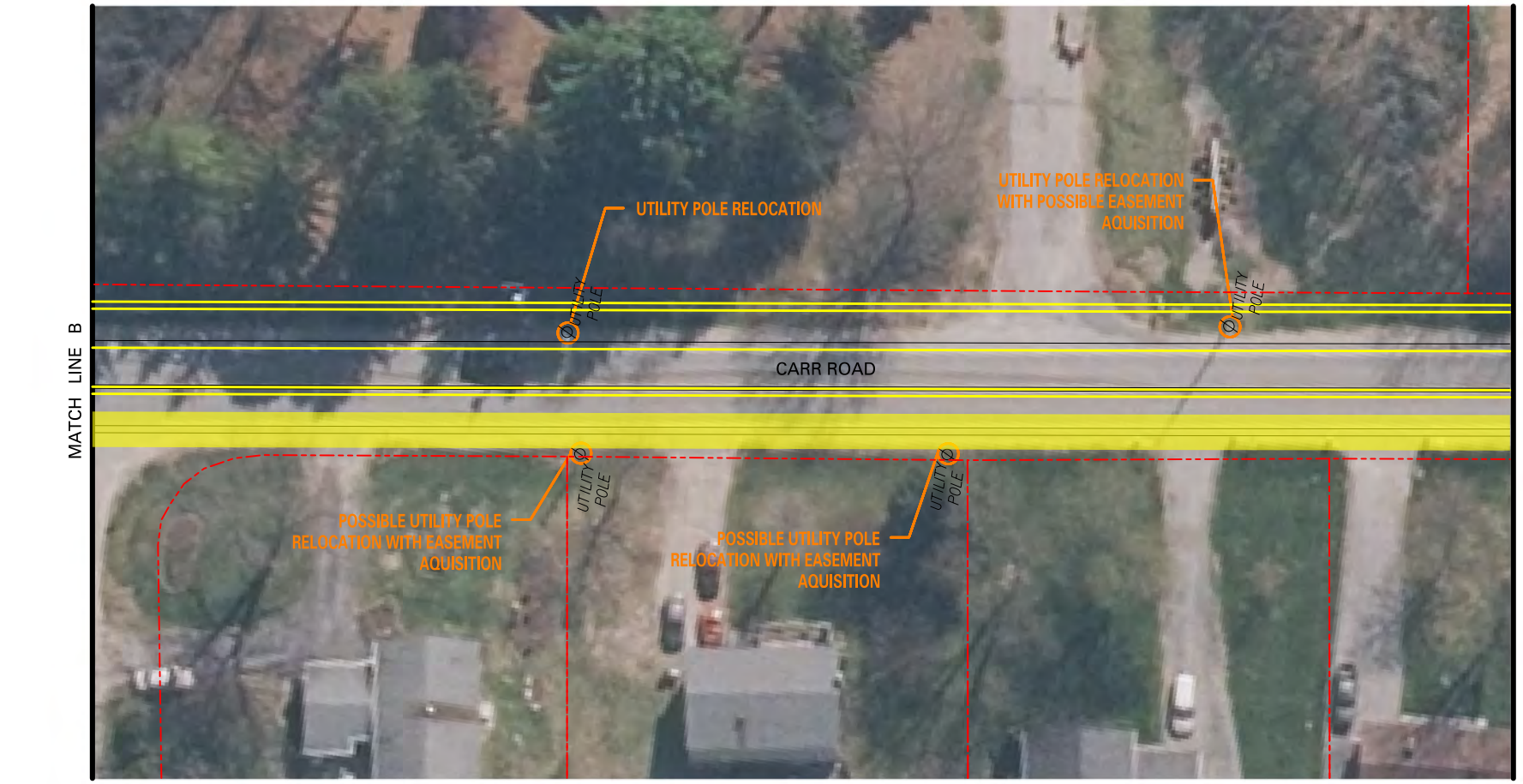
Greenman-Pedersen
CONSULTING ENGINEERS
GPI
80 Wolf Road
Suite 300
Albany, NY 12205

2015 TRAFFIC ENGINEERING STUDIES
TOWN OF WILTON, NEW YORK

GAVIN PARK PATH PLANNING

CARR ROAD
MULTIUSE PATH CONCEPT

JOB NO.	SCALE:	DATE:	FIGURE NO.
2015200.00	AS SHOWN	OCT. 2015	2



15 0 15 30 45 60'
1" = 30'

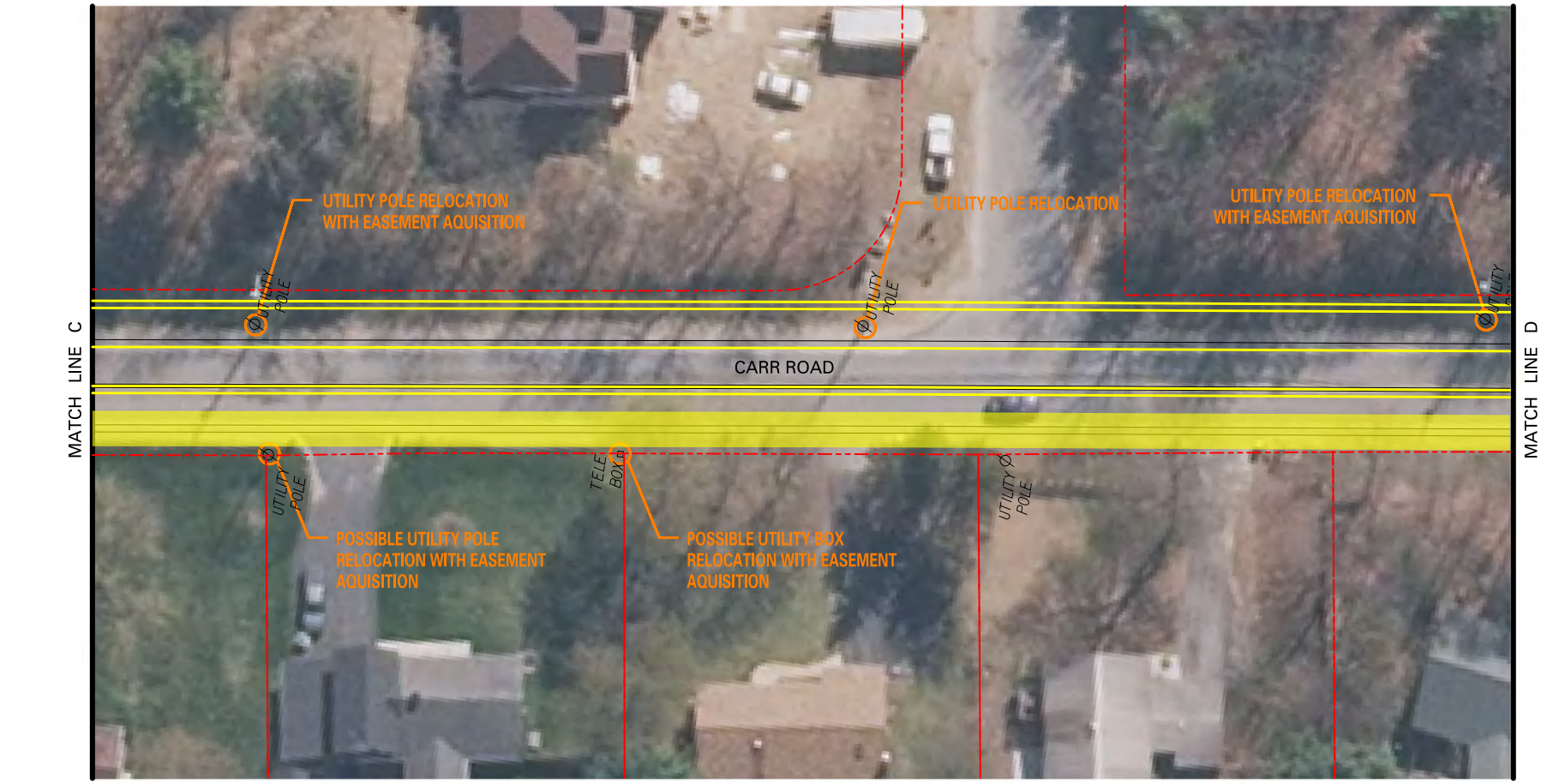
Greenman-Pedersen
CONSULTING ENGINEERS
GPI
80 Wolf Road
Suite 300
Albany, NY 12205

2015 TRAFFIC ENGINEERING STUDIES
TOWN OF WILTON, NEW YORK

GAVIN PARK PATH PLANNING

CARR ROAD
MULTIUSE PATH CONCEPT

JOB NO.	SCALE:	DATE:	FIGURE NO.
2015200.00	AS SHOWN	OCT. 2015	3



15 0 15 30 45 60'
1" = 30'

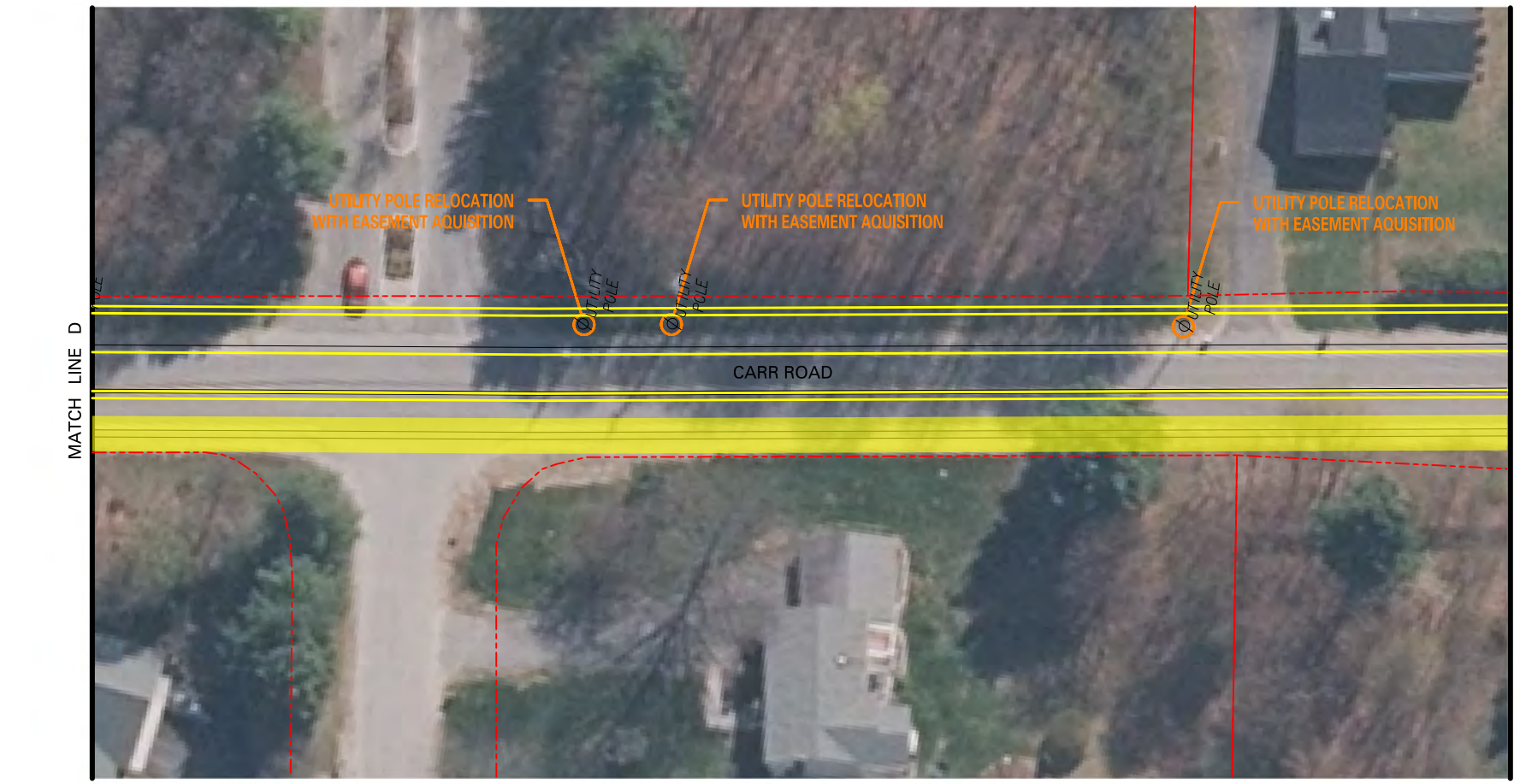
Greenman-Pedersen
CONSULTING ENGINEERS
GPI
80 Wolf Road
Suite 300
Albany, NY 12205

2015 TRAFFIC ENGINEERING STUDIES
TOWN OF WILTON, NEW YORK

GAVIN PARK PATH PLANNING

CARR ROAD
MULTIUSE PATH CONCEPT

JOB NO.	SCALE:	DATE:	FIGURE NO.
2015200.00	AS SHOWN	OCT. 2015	4



15 0 15 30 45 60'

1" = 30'

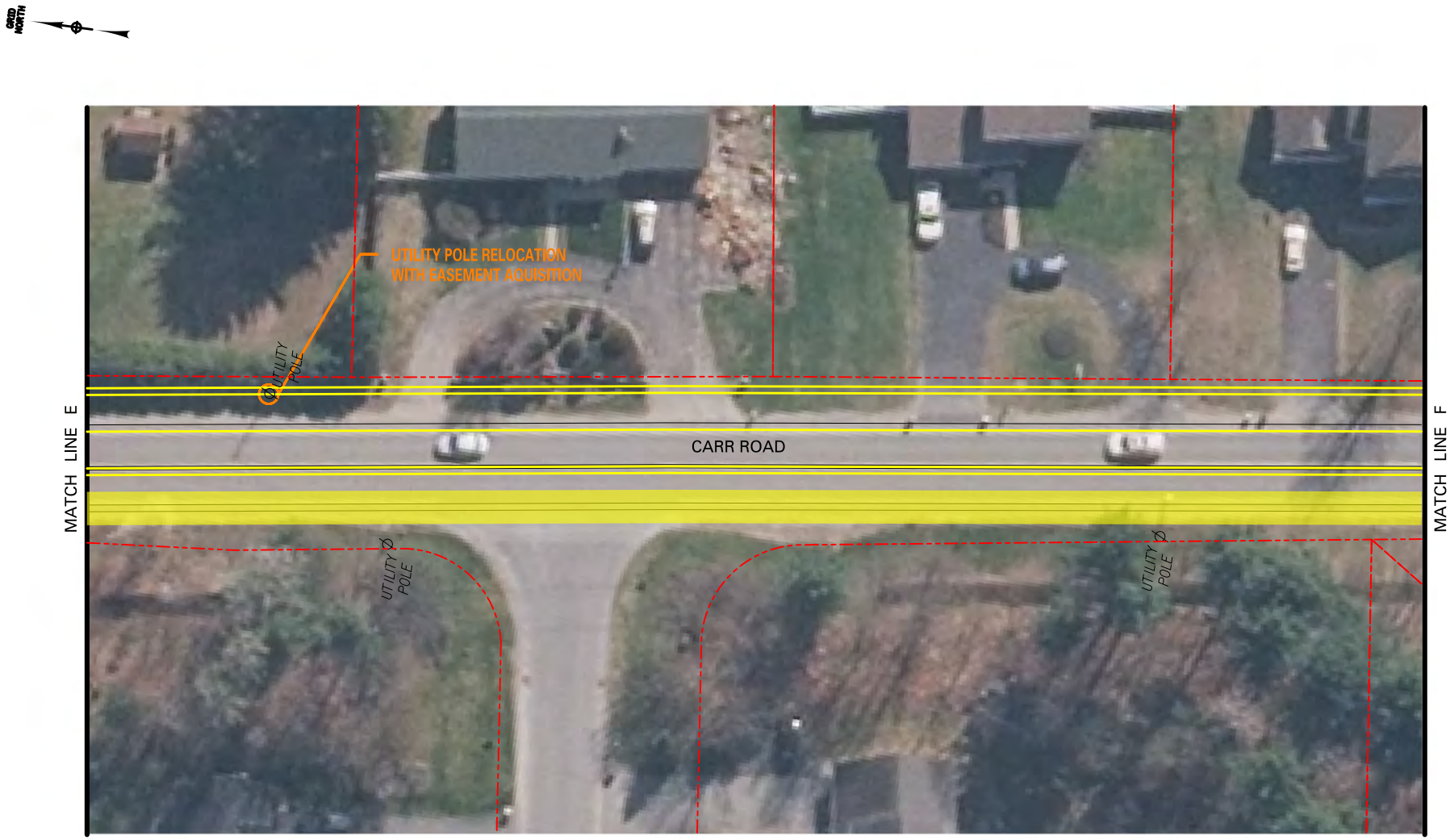
Greenman-Pedersen
CONSULTING ENGINEERS
GPI
80 Wolf Road
Suite 300
Albany, NY 12205

2015 TRAFFIC ENGINEERING STUDIES
TOWN OF WILTON, NEW YORK

GAVIN PARK PATH PLANNING

CARR ROAD
MULTIUSE PATH CONCEPT

JOB NO.	SCALE:	DATE:	FIGURE NO.
2015200.00	AS SHOWN	OCT. 2015	5



15 0 15 30 45 60'
1" = 30'

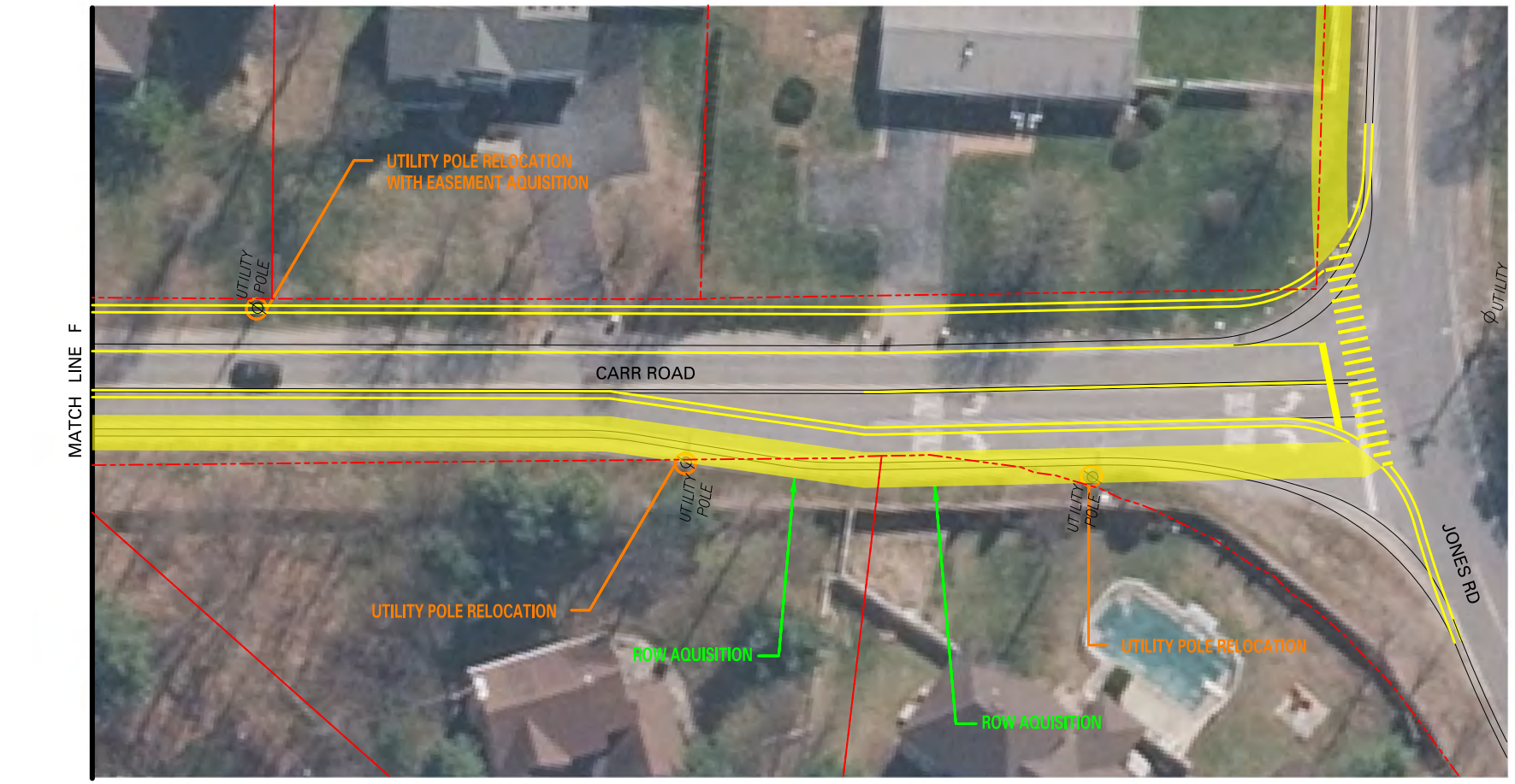
Greenman-Pedersen
CONSULTING ENGINEERS
GPI
80 Wolf Road
Suite 300
Albany, NY 12205

2015 TRAFFIC ENGINEERING STUDIES
TOWN OF WILTON, NEW YORK

GAVIN PARK PATH PLANNING

CARR ROAD
MULTIUSE PATH CONCEPT

JOB NO.	SCALE:	DATE:	FIGURE NO.
2015200.00	AS SHOWN	OCT. 2015	6



15 0 15 30 45 60'
1" = 30'

Greenman-Pedersen
CONSULTING ENGINEERS
GPI
80 Wolf Road
Suite 300
Albany, NY 12205

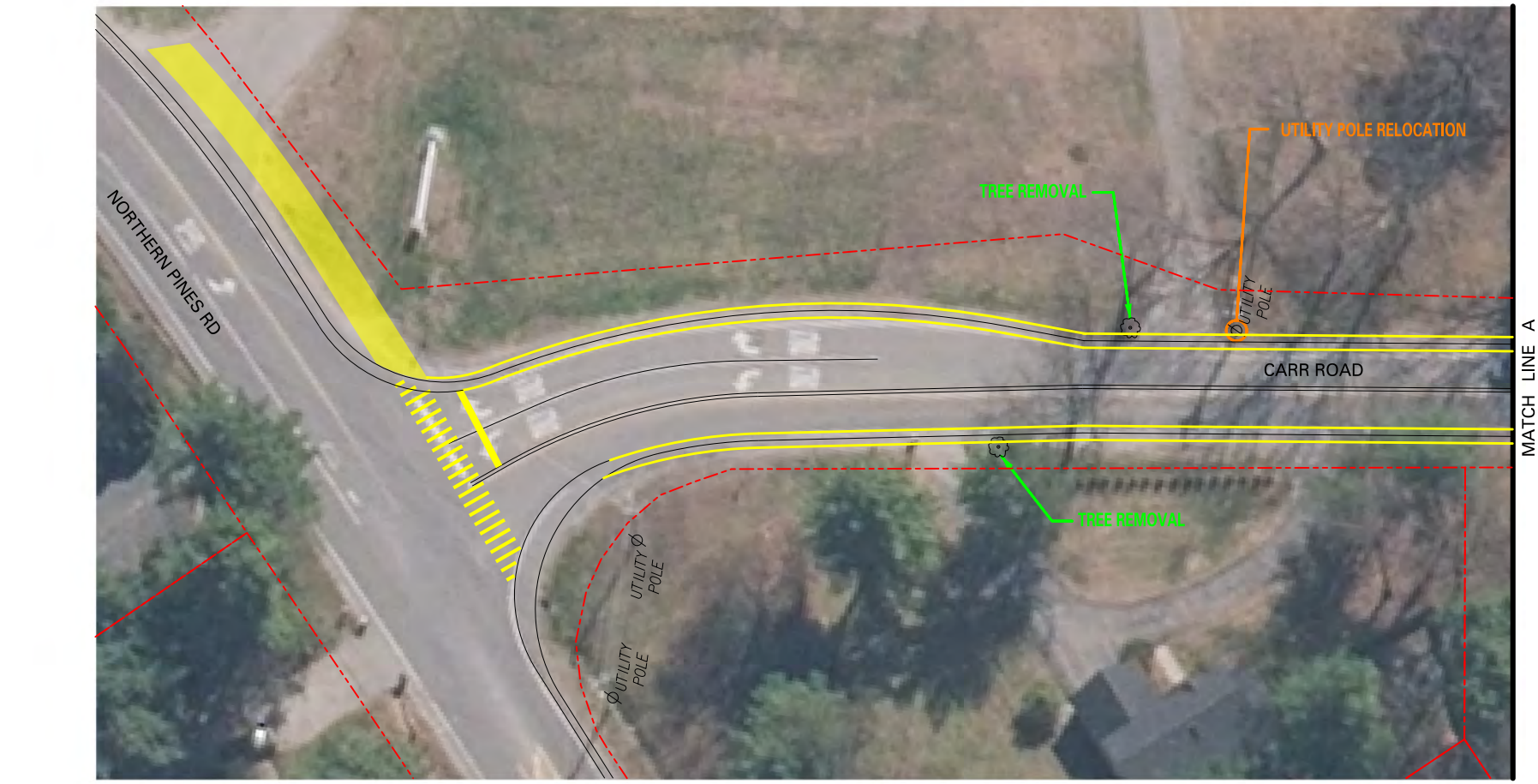
2015 TRAFFIC ENGINEERING STUDIES
TOWN OF WILTON, NEW YORK

GAVIN PARK PATH PLANNING

CARR ROAD
MULTIUSE PATH CONCEPT

JOB NO.	SCALE:	DATE:	FIGURE NO.
2015200.00	AS SHOWN	OCT. 2015	7

APPENDIX G
Conceptual Shoulder Widening Sketches
Carr Road



15 0 15 30 45 60'
1" = 30'

Greenman-Pedersen
CONSULTING ENGINEERS
GPI
80 Wolf Road
Suite 300
Albany, NY 12205

2015 TRAFFIC ENGINEERING STUDIES
TOWN OF WILTON, NEW YORK

GAVIN PARK PATH PLANNING

CARR ROAD
SHOULDER WIDENING CONCEPT

JOB NO.	SCALE:	DATE:	FIGURE NO.
2015200.00	AS SHOWN	OCT. 2015	1

15 0 15 30 45 60'
1" = 30'

Greenman-Pedersen
CONSULTING ENGINEERS
GPI
80 Wolf Road
Suite 300
Albany, NY 12205

2015 TRAFFIC ENGINEERING STUDIES
TOWN OF WILTON, NEW YORK

GAVIN PARK PATH PLANNING

CARR ROAD
SHOULDER WIDENING CONCEPT

JOB NO.	SCALE:	DATE:	FIGURE NO.
2015200.00	AS SHOWN	OCT. 2015	2

15 0 15 30 45 60'
1" = 30'

Greenman-Pedersen
CONSULTING ENGINEERS
GPI
80 Wolf Road
Suite 300
Albany, NY 12205

2015 TRAFFIC ENGINEERING STUDIES
TOWN OF WILTON, NEW YORK

GAVIN PARK PATH PLANNING

CARR ROAD
SHOULDER WIDENING CONCEPT

JOB NO.	SCALE:	DATE:	FIGURE NO.
2015200.00	AS SHOWN	OCT. 2015	3

15 0 15 30 45 60'
1" = 30'

Greenman-Pedersen
CONSULTING ENGINEERS
GPI
80 Wolf Road
Suite 300
Albany, NY 12205

2015 TRAFFIC ENGINEERING STUDIES
TOWN OF WILTON, NEW YORK

GAVIN PARK PATH PLANNING

CARR ROAD
SHOULDER WIDENING CONCEPT

JOB NO.	SCALE:	DATE:	FIGURE NO.
2015200.00	AS SHOWN	OCT. 2015	4

15 0 15 30 45 60'
1" = 30'

Greenman-Pedersen
CONSULTING ENGINEERS
GPI
80 Wolf Road
Suite 300
Albany, NY 12205

2015 TRAFFIC ENGINEERING STUDIES
TOWN OF WILTON, NEW YORK

GAVIN PARK PATH PLANNING

CARR ROAD
SHOULDER WIDENING CONCEPT

JOB NO.	SCALE:	DATE:	FIGURE NO.
2015200.00	AS SHOWN	OCT. 2015	5

15 0 15 30 45 60'
1" = 30'

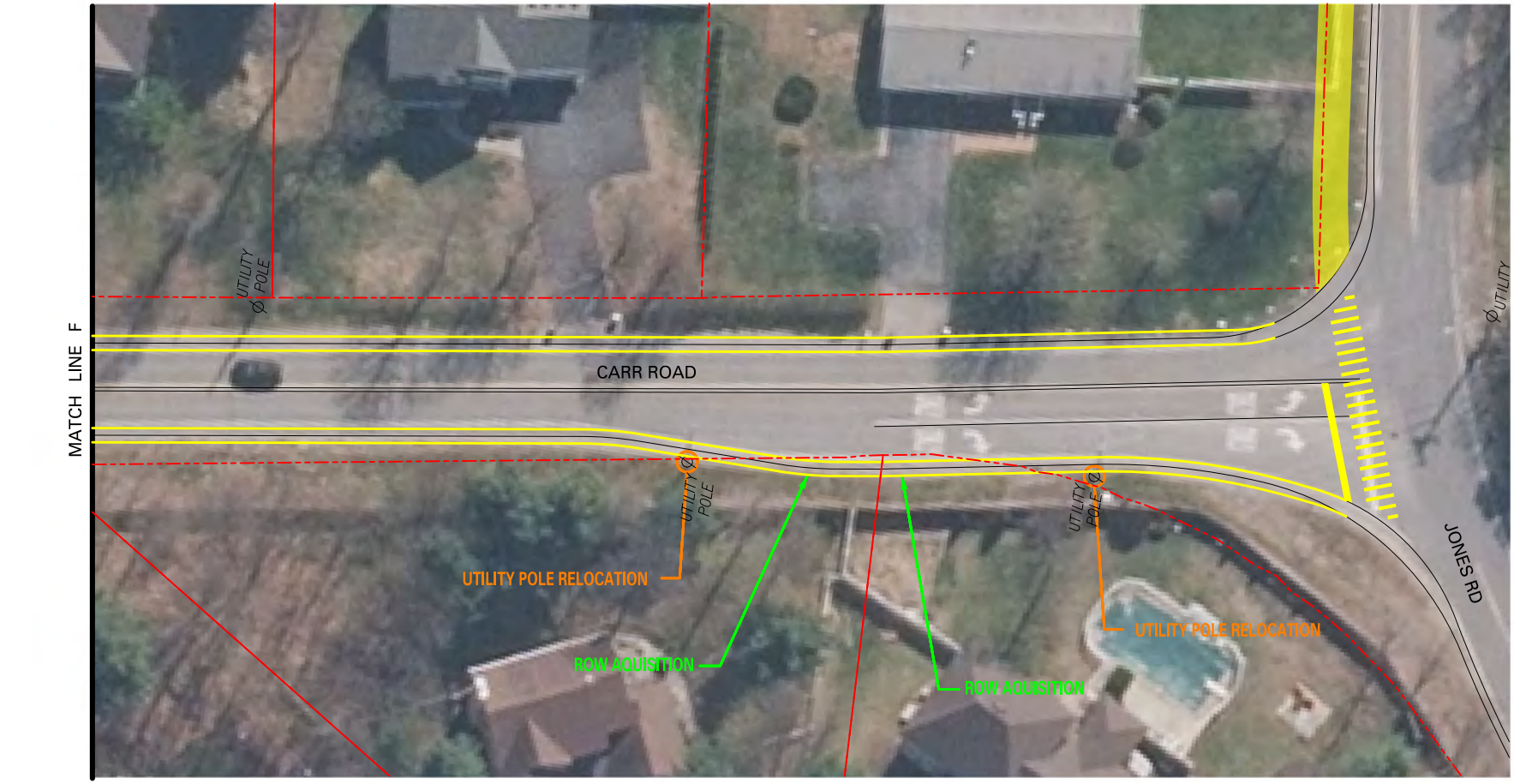
Greenman-Pedersen
CONSULTING ENGINEERS
GPI
80 Wolf Road
Suite 300
Albany, NY 12205

2015 TRAFFIC ENGINEERING STUDIES
TOWN OF WILTON, NEW YORK

GAVIN PARK PATH PLANNING

CARR ROAD
SHOULDER WIDENING CONCEPT

JOB NO.	SCALE:	DATE:	FIGURE NO.
2015200.00	AS SHOWN	OCT. 2015	6



15 0 15 30 45 60'
1" = 30'

Greenman-Pedersen
CONSULTING ENGINEERS
GPI
80 Wolf Road
Suite 300
Albany, NY 12205

2015 TRAFFIC ENGINEERING STUDIES
TOWN OF WILTON, NEW YORK

GAVIN PARK PATH PLANNING

CARR ROAD
SHOULDER WIDENING CONCEPT

JOB NO.	SCALE:	DATE:	FIGURE NO.
2015200.00	AS SHOWN	OCT. 2015	7

APPENDIX H
Gurn Springs Road and Dimmick Road
Intersection Letter from GPI

GPI Greenman-Pedersen, Inc.
Engineering and Construction Services

Offices Throughout the United States

December 4, 2015

Ryan Riper, P.E.
Director of Planning & Engineering
Town of Wilton
22 Traver Road
Wilton, NY 12831

Re: Gurn Springs Road & Dimmick Road Intersection Review
Town of Wilton Traffic Study

Dear Mr. Riper:

Greenman-Pedersen, Inc. has performed a traffic review for the intersection of Gurn Springs Road and Dimmick Road located in the Town of Wilton, Saratoga County, New York. The purpose of this review was to observe the existing conditions, review the recent crash history and identify corrective actions that could improve safety. A summary of our review and findings are as follows:

Background Information

The Gurn Springs Rd and Dimmick Rd intersection (depicted on the right) is a 4-leg intersection with stop sign control for the Gurn Spring Rd approaches. All approaches have a single lane from which all movements (left, through, right) are made. Gurn Springs Road has a posted speed limit of 45 mph; Dimmick Road does not have a posted speed limit so a 55 mph is the legal speed limit. Traffic counts performed in 2014 along Dimmick Road reveal the 85th percentile speed (typically used for design) to be 51 mph.

Accident history was reviewed at this location as part of the 2015 Update to the Town of Wilton's Townwide Traffic Planning Study. In that study, it was found that three accidents occurred over the most recently reported 3-year period. This translated to an accident rate of 3.73 accidents per million entering vehicles (Acc/MEV), which is considerably higher than the 0.26 acc/MEV statewide average for similar facilities. Though the three accidents translates to a high accident rate, that is only because of the low volumes that travel these roadways.

To address operational and safety concerns at this location several investigations were conducted. These investigations included a review of sight distance, roadway geometry, accident history, existing signage and traffic control. These tasks are detailed below.

Accident Review

Three accidents were noted at this location in the 3-year period between January 1, 2011 and December 31, 2013. Two of these accidents were right angle (one involving a bicyclist) and one involved a fixed object (see accident diagram in Appendix A). In looking at the accidents, which average just one per year, there is no discernable pattern of concern.

Sight Distance Review

The sight distance along Dimmick Road from each of the stop locations on Gurn Springs Road is more than 800 feet in either direction. AASHTO and NYSDOT standards for sight distance with a 50 mph design speed is 555 feet to make a left turn and 480' to make a right turn. The required distance to make a safe stop for an obstruction is 425 feet. The sight distance available at this intersection is more than sufficient for the traffic conditions.

Existing Gurn Springs Rd Stop Sign

Signage Review

Along Dimmick Road there are "Intersection Ahead" signs on both approaches located approximately 800 foot in advance of the intersection. For Gurn Springs Road, there are stop signs at the intersection on both approaches with supplemental warning panels that state "Cross Traffic Does Not Stop" and red retroreflective sign post strips on each post. These stop signs are 30" wide and are mounted approximately 50 foot ahead of the stop bar on each approach.

In reviewing the accidents present at this location, there does not appear to be an issue with Gurn Springs Road traffic not stopping at the intersection. However, if there is a perceived concern that this is occurring, the existing "Stop" signs could be replaced with oversized 36 inch wide "Stop" signs to help mitigate. Additionally, supplemental "Stop" signs could be placed on the left side of the road on each of the Gurn Springs Road approaches, such that both approaches have two stop signs visible. A picture depicting this type dual stop sign configuration is shown to the right.

Example dual-stop sign configuration

Example Blinking LED Warning Sign

As stated earlier, the 85th percentile operating speed is 51 mph. If the Town wishes to bring more awareness to this intersection and possibly reduce speeds within this area, it is suggested that a solar powered flashing beacons or blinking LED signs could be installed to replace the existing "Intersection Ahead" warning signs along Dimmick Road. These signs would be placed 250 feet in advance of the intersection based on MUTCD guidelines, as opposed to the 800 feet that the current "Intersection Ahead" signs are now placed. The current signs are too far away from the intersection to provide proper emphasis and should be relocated, regardless of whether or not a flashing sign option is implemented.

Consideration of Installing 4-Way Stop Control

Town officials have considered installing 4-Way stop sign control at this intersection to address safety concerns. The Manual of Uniform Traffic Control Devices (MUTCD) has identified several conditions where this treatment could be an effective safety measure including crash types and frequency as well as minimum traffic volumes an noted below:.

> **Section 2B.07 Multi-Way Stop Applications**
> Support:
> 01 Multi-way stop control can be useful as a safety measure at intersections if certain traffic conditions exist. Safety concerns associated with multi-way stops include pedestrians, bicyclists, and all road users expecting other road users to stop. Multi-way stop control is used where the volume of traffic on the intersecting roads is approximately equal.
> 02 The restrictions on the use of STOP signs described in Section 2B.04 also apply to multi-way stop applications.
> *Guidance:*
> 03 *The decision to install multi-way stop control should be based on an engineering study.*
> 04 *The following criteria should be considered in the engineering study for a multi-way STOP sign installation:*
> *A. Where traffic control signals are justified, the multi-way stop is an interim measure that can be installed quickly to control traffic while arrangements are being made for the installation of the traffic control signal.*
> *B. Five or more reported crashes in a 12-month period that are susceptible to correction by a multi-way stop installation. Such crashes include right-turn and left-turn collisions as well as right-angle collisions.*
> *C. Minimum volumes:*
> *1. The vehicular volume entering the intersection from the major street approaches (total of both approaches) averages at least 300 vehicles per hour for any 8 hours of an average day; and*
> *2. The combined vehicular, pedestrian, and bicycle volume entering the intersection from the minor street approaches (total of both approaches) averages at least 200 units per hour for the same 8 hours, with an average delay to minor-street vehicular traffic of at least 30 seconds per vehicle during the highest hour; but*
> *3. If the 85th-percentile approach speed of the major-street traffic exceeds 40 mph, the minimum vehicular volume warrants are 70 percent of the values provided in Items 1 and 2.*
> *D. Where no single criterion is satisfied, but where Criteria B, C.1, and C.2 are all satisfied to 80 percent of the minimum values. Criterion C.3 is excluded from this condition.*

None of the conditions identified in this guidance exist at the Gurn Springs Rd and Dimmick Rd intersection.

Installing a 4 –Way stop sign control when not warranted could create a larger safety problem by introducing a greater risk of rear end accidents on Dimmick Rd since a required stop would be introduced. A 4-way stop sign control where unwarranted could also increase the risk of severe crashes caused by non-compliance with the posted stop signs.

Findings and Recommendations

Though the accident rate appears high at this location that is only because of the low traffic daily volume entering the intersection. There have only been three accidents reported in the last three years, and there is no discernable pattern or cause. Sight distance at the intersection was reviewed and found to be more than adequate for the operating speeds. Though there is no indication of a problem with vehicles along Gurn Springs Road stopping at the intersection, enhanced stop control signing could be implemented. Therefore to address the observed operations and conditions we have identified several actions for the Town to consider enhancing safety at this location:

1. Replace the existing stop signs with a dual stop sign configuration with oversized 36 inch wide panels.

2. Move the existing "Intersection Ahead" warning signs closer to the intersection. They are currently located 800 feet ahead and should be located 250 feet ahead based on MUTCD guidelines.
3. Consider installing Enhanced "Intersection Ahead" signs with either flashing beacons, or blinking LEDs in place of the standalone static "Intersection Ahead" signs. These treatments could be solar powered and would bring better awareness to the warning sign.

Should you have any questions regarding the study or require any additional information, please feel free to contact me or Mike Wieszchowski at (518) 453-9431.

Sincerely,
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